is identical for all of these measurements, or that it is possible to calculate the line shape from the information in Reference 5, which concerns itself with water and ice only.

4. From our previous work (*6*), we are confident that the range distribution of positrons is not Gaussian in shape, yet D and B imply a Gaussian LSF by adding the various widths in quadrature. It is impossible to derive a value accurately for the width of one component of an LSF if all three major components have uncertain widths and line shapes.

In our previous work (*6*), we were able to experimentally derive the line shape due to our instrumentation, and we eliminated the spread due to the angular deviation of the annihilation quanta by performing the measurement in a noncoincident mode. In addition, we used a system with higher resolution—2.4 mm FWHM, which is still insufficient. The only undetermined factor in our measurements was the effect of the positron range. We calculated this effect theoretically and compared the results with our measurements. There was excellent correlation between calculation and measurement. Thus we are confident that our measurements and calculations are reliable.

EDWARD J. HOFFMAN
MICHAEL E. PHELPS
The University of California
Los Angeles, California

REFERENCES

1. PHELPS ME, HOFFMAN EJ: Reply No. 1. *J Nucl Med* 17: 757–758, 1976

2. HOFFMAN EJ, PHELPS ME: An analysis of some of the physical aspects of positron transaxial tomography. *Comput Biol Med* 6: 345–360, 1976

3. CHO ZH, CHAN JK, ERICKSSON L, et al.: Positron ranges obtained from biomedically important positron-emitting radionuclides. *J Nucl Med* 16: 1174–1176, 1975

4. HEITLER W: *The Quantum Theory of Radiation.* Oxford University Press, London, 1954

5. COLOMBINO P, FISCELLA B, TROSSI L: Study of positronium in water and ice from 22 to −144° C by annihilation quantum measurements. *Nuovo Cimento* 38: 707–723, 1965

6. PHELPS ME, HOFFMAN EJ, HUANG SC, et al.: Effect of position range on spatial resolution. *J Nucl Med* 16: 649–652, 1975

Direct Recording of Rectilinear Thyroid Scan Images on 5 × 7-In. Film

I read with interest the technical note by Reese and Miskin (*1*) and agree that cost is a central issue in most clinical laboratories.

While at the Miami Valley Hospital, Dayton, Ohio, and with the help of Sylvan Eller, M.D., I developed an inexpensive device to allow a scanner* to use 5 × 7-in. film for thyroid scans.

A thin sheet of clear Plexiglas was cut to fit into the scanner's 14 × 17-in. film cassette. Very thin strips of Plexiglas were appropriately spaced and taped onto the 14 × 17-in. sheet as a guide to set in smaller film while in the darkroom. The x-ray film is held in the cassette by the Plexiglas sheet when the slide is pulled. The film is centered by the guides. Light transmitted through the Plexiglas exposes the film.

The probe must be centered carefully for each scan. The Teledeltos output area is the best aid to assure that the probe is correctly centered to record on the x-ray film. The Plexiglas should be checked regularly to clear surface of smudges. Cleaning should also reduce the occurrence of static electricity which can leave marks on the developed film.

We found that lowered cost will result from substituting 5 × 7-in. x-ray film for 14 × 17-in. film when performing thyroid scans on this scanner.

DAVID K. KAFFENBERGER
Good Samaritan Hospital
Dayton, Ohio

FOOTNOTE

* Picker Magnascanner 500, Cleveland, Ohio.

REFERENCE

1. REESE I, MISHKIN FS: Direct recording of rectilinear scan images on 4 × 5 in. film. *J Nucl Med* 17: 937–938, 1976

Assessment of a Multiformat Imager with a Scintillation Camera

A performance of a multiformat imager associated with a scintillation camera led us to the discovery that the number of points plotted on the imager is not always the same as the number indicated by the camera, especially at high count rates. This is unexpected, since the camera (the Pho/Gamma IV) is confined to the output frequencies manageable by the imager (Microdot). The ratio of plotted points to camera counts has varied from 0.6 to approximately 1.2, depending on the particular fault.

The system is tested by setting the camera's preset counts to a low but statistically significant number, setting the imager's intensity control to produce distinct dots, exposing the film with a large frame size, and counting the dots produced on the film. Although a small discrepancy is not critical, it does indicate a malfunction, and a large discrepancy would degrade picture quality.

F. C. G. SOUTHON
R. F. PALSER
Health Sciences Centre
Winnipeg, Manitoba

Purity of the Adrenal-Scanning Agents, 19-Iodocholesterol and 6-Iodomethylnorcholesterol

Recently it has been reported in this journal (*1,2*) and elsewhere (*3–5*) that 19-iodocholest-5-en-3β-ol (19-iodocholesterol, **I**), when synthesized by the method of Counsell et al. (*6*), contains the homoallylic isomer 6β-iodomethyl-19-norcholest-5(10)-en-3β-ol (6-iodomethylnorcholesterol, **II**) in amounts ranging from 10 to 60%. Since **II** has been reported to be 5–10 times more active than **I** with respect to its accumulation in the adrenal gland, **II** is of considerable importance as a potential new radiopharmaceutical (*1,2*). The physical characteristics and spectroscopic data of **II** as reported by two different groups (*1,4*) are, however, significantly different. The purpose of this letter, then, is to make investigators wishing to use these agents aware

of problems in the synthesis, isolation, and characterization of I and II, and to call their attention to recently developed procedures for preparing I and II in greater than 98% chemical and radiochemical purity (*5,7*).

We have recently reported (*5*) a new route for the synthesis of I in greater than 98% chemical purity, the purity being established unambiguously by ^{13}C nuclear magnetic resonance (CMR). We then prepared II from I via the general route employed by the other groups (*7*). CMR and high-pressure liquid chromatography (HPLC) showed that this product contained not only the desired compound but at least 5 other impurities. HPLC was then employed to separate gram amounts of II, the purity of which (>98%) was established unequivocally by CMR.

Previous syntheses of II (*1,3,4*) employed preparative thin-layer chromatography (TLC) to obtain milligram quantities of II from a mixture containing both I and II. Kojima et al. (*1,3*) reported II as a glass, but Basmadjian et al. (*4*) as a low-melting solid. Furthermore, the proton nuclear magnetic (PMR) spectra of II reported by the two groups are significantly different. Our PMR data on II agree with those of Kojima et al. (*1,3*) but not with Basmadjian et al. (*4*). Moreover, the peak positions and intensities reported by Basmadjian et al. are not possible for steroids containing the C-20 cholestane side-chain (*7,8*). The PMR data reported for CH_2I in II by Basmadjian et al. are inconsistent with expectation (*9*). Since their data reported for CH_2I in II are almost identical with the CH_2I data for impure I (*6*), a possible explanation for the anomalous PMR data reported by Basmadjian et al. would be that although they have obtained II, it is contaminated by I and other unidentified compounds. This would not be surprising, since complete TLC separation of two compounds having a difference in RF of only 0.1, as in the case of I and II, can frequently be hard to achieve. For the preceding reasons, we believe that HPLC is the method of choice for purification of II.

In the PMR spectra of steroids, only methyl proton resonances and resonances of protons in or adjacent to functional groups can be assigned to specific protons (*9*). Most of the proton resonances, however (28 in the case of I, 29 in the case of II), form an overlapping, unresolved, and unassignable pattern that covers most of the right-hand half of the PMR spectrum. (See the PMR spectra of I and II in reference *7*.) Therefore, impurities that have proton peaks only in this region can go undetected in the PMR spectrum of a steroidal sample. For this reason, the PMR spectrum alone cannot unequivocally establish the purity of a steroid. On the other hand, inspection of the CMR spectra of I or II (*7*) shows 27 well-resolved and assignable peaks for the 27 carbons of the steroid. Therefore, impurity peaks (or their absence) are very readily recognizable from the CMR spectrum of a steroid. We believe, accordingly, that CMR is the method of choice for establishing the identity and purity of II. Since methods have been presented for the preparation of gram amounts of I (*5*) and II (*7*) of >98 mole % proven chemical purity and >99% radiochemical purity, the toxicity and radiopharmaceutical properties of the pure compounds can now be evaluated.

KATHERINE N. SCOTT
MARGARET W. COUCH
THOMAS H. MARECI
CLYDE M. WILLIAMS
Veterans Administration Hospital and
Department of Radiology
University of Florida
Gainesville, Florida

REFERENCES

1. KOJIMA M, MAEDA M, OGAWA H, et al.: New adrenal-scanning agent. *J Nucl Med* 16: 666–668, 1975

2. SARKAR SD, BEIERWALTES WH, ICE RD, et al.: A new and superior adrenal scanning agent, NP-59. *J Nucl Med* 16: 1038–1042, 1975

3. KOJIMA M, MAEDA M, OGAWA H, et al.: Homoallylic rearrangement of 19-iodocholesterol. *J Chem Soc Chem Commun* 1975: 47, 1975

4. BASMADJIAN GP, HETZEL KR, ICE RD, et al.: Synthesis of a new adrenal cortex imaging agent 6β-^{131}I-iodomethyl-19-norcholest-5(10)-en-3β-ol (NP-59). *J Labelled Compd* 11: 427–434, 1975

5. COUCH MW, SCOTT KN, WILLIAMS CM: New method for the synthesis of radioactive 19-iodocholest-5-en-3β-ol. *Steroids* 27: 451–458, 1976

6. COUNSELL RE, RANADE VV, BLAIR RJ, et al.: Tumor localizing agents. IX. Radioiodinated cholesterol. *Steroids* 16: 317–328, 1970

7. SCOTT KN, COUCH MW, MARECI TH, et al.: Synthesis and purification of radioactive 6β-iodomethyl-19-norcholest-5(10)-en-3β-ol. *Steroids* 28: 295–303, 1976

8. BHACCA NS, JOHNSON LF, SHOOLERY JN: *High Resolution NMR Spectra Catalog*, vol 1. Palo Alto, Varian Associates, 1962, Spectrum No. 363; Bhacca NS, Hollis DP, Johnson LF, et al.: *High Resolution NMR Spectra Catalog*, vol 2. Palo Alto, Varian Associates, 1963, Spectrum No. 698. Also reference *9* pages 7 and 35

9. BHACCA NS, WILLIAMS DH: *Applications of NMR Spectroscopy in Organic Chemistry—Illustrations from the Steroid Field*. San Francisco, Holden-Day, 1964

Reply

Dr. Scott et al. prepared 6β-iodomethyl-19-norcholest-5(10)-en-3β-ol (II) by refluxing 19-iodocholest-5-en-3β-ol (I) in isopropanol. Although the procedure appears to provide adequate separation and identification by CMR and HPLP, the reaction time required to process the rearrangement (48 hr) and the use of isopropanol as a solvent are definite disadvantages, because long reaction time in the rearrangement of I to II in alcoholic solvents leads to the formation of solvolytic or damaged products in considerable amounts. Our result demonstrates that smooth conversion of I into II has been accomplished by the heating of I in acetonitrile without the appreciable formation of by-products, and a subsequent column chromatographic purification results in the isolation of pure II in a good yield (*1*). Thus, our previous procedure also appears sufficient to obtain pure II.

We have already reported that the available synthesis of pure I involves selective hydrolysis of 19-iodocholest-5-en-3β-ol acetate, which is produced in the reaction of sodium iodide with cholest-5-ene-3β,19-diol 19-p-toluenesulphonate 3-acetate in isopropanol, the purity being established unambiguously by PMR (*1*). We are now investigating the solvolytic behavior of 19-tosyloxycholesterol, I, and II, which results will be described in detail elsewhere. Lastly, we have also reported an alternative synthesis of II achieved through the use of 6β-p-toluenesulphonoxymethyl derivatives (*2*).

MASAHARU KOJIMA
MINORU MAEDA
Faculty of Pharmaceutical Sciences
Kyushu University
Fukuoka, Japan