shell vacancies per 100 disintegrations. Tabulation of these "particles" yields an average "beta" energy per disintegration, $\bar{E}_\beta$, of 77.3 kev. Using our schedule of photons, we find Γ, (specific gamma-ray emission) to be 0.35. This is in agreement with the value by Mann (5). We, therefore, believe these values valid for correction of the dosimetry stated by Dr. Sodee.

It should also be pointed out that our "schedule of photons" agrees with that used by the major suppliers of Hg^{197}. This assay now seems to be standardized, eliminating the confusion of the past.

We believe this analysis to be as correct as present literature will support and apologize to Dr. Sodee for any embarrassment caused by his use of the erroneous values.

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TO THE EDITOR:

In his Letter to the Editor in the January Journal of Nuclear Medicine Dr. Sodee states, "In clinical scanning Hg^{197} Neohydrin has proved to be far superior to other available radionuclides". The only data cited supporting this claim are ". . . the tissue to background ratio has been increased to a factor of 2.7 as opposed to the Hg^{203} ratio of 1.7. This can be explained by Hg^{197}'s ease of collimation, increased number of usable photons per disintegration and the increased efficiency of our sodium iodide crystals at this lower engery."

The exact meaning of Sodee's ". . . tissue to background ratio" is not clear but judging by the explanations offered it involves a higher count from Hg^{197} than from Hg^{203} under comparable conditions. This improved ratio cannot come from ". . . Hg^{197}'s ease of collimation." The popular 19 and 37 hole 3″ lead collimators are grossly overdesigned for both Hg^{197} and Hg^{203} with septa and walls essentially opaque to the .28 MeV γ rays of Hg^{203}. Sodee's other explanations are qualitatively correct but quantitatively inadequate to explain such a marked improvement. The best current estimates are that Hg^{197} provides 98 usable photons per 100 disintegrations and Hg^{203} 83 usable photons. The photopeak efficiencies of the standard 3″ × 2″ crystal, 75-80% for Hg^{203} and about 90% for Hg^{197}, also favor Hg^{197}. However, any modest increase in count rate from these sources is more than compensated by the poor tissue penetration of the weak Hg^{197} γ rays. This is especially true in brain scanning where deep-seated lesions must be visualized through overlying normal brain tissue and the calvarium.

There is an important source of increased count rate not mentioned in Sodee's letter. It is the unwanted counts originating outside of the field of view of the collimator but reaching the crystal by scatter with little or no energy loss and by x-ray exitation in the collimator walls. Harris *et. al.* (J. Nuclear Med. 4, 183 (1963)) have pointed out the degradation of scan images by the smearing effect of these unwanted photons. In our own laboratory, studies with the International Atomic Energy Agency Standard Scanning Phantom indicate poor visualiza-

tion with Hg^{197} compared to Hg^{203} for both surface and deep "tumors". The scatter problem is a serious drawback in the utilization of low γ ray energy isotopes in scanning.

It is possible that Sodee's ". . . tissue to background ratio" refers to the count rate over a lesion compared to normal brain background (usually called target:non-target ratio). Collimator design, tumor size and location, radioactivity level, etc. all effect target:non-target ratio. Without experimental details it is difficult to evaluate an improvement from 1.7 to 2.7 when using Hg^{197} instead of Hg^{203}. It is possible that large surface lesions would give rise to better target:non-target ratios because of the attenuation of Hg^{197} radiation coming from deeper brain layers but conversely this implies that deep lesions would be difficult to visualize. In general, our laboratory studies indicate that the target:non-target ratios with Hg^{197} are worse than with Hg^{203}.

Because of its short half-life, the radiation dose from Hg^{197} is distinctly lower than from Hg^{203}. This permits higher scanning doses. When routine scanning equipment is used (as opposed to collimators and crystals specifically designed for low energy isotopes) this is the only advantage of Hg^{197}. The other physical properties of the isotope are detrimental to good scanning. Each investigator must weigh these factors for himself. In our opinion the improved ability to detect small deep-seated lesions more than compensates for the high radiation dose from Hg^{203}.

No doubt Hg^{203} Neohydrin will be replaced by better brain scanning agents in the near future. There are many possible compounds with a wide variety of physical and biological properties. It would be a shame to settle for an agent with the deficiencies of Hg^{197} Neohydrin.

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TO THE EDITOR:

In his paper entitled "The Use of a Modified Radioactive Test for Evaluating the Peripheral Circulation" which appeared in the Journal, May 1963 pp 244-248 Dr. Razzak suggests that the areas under the uptake curves be calculated according to the formula:

$$\text{Area} = N_F\,(t - 0.69\,T_{\frac{1}{2}})$$

where N_F is the level of activity at 10 minutes, t equals 10 minutes, and $T_{\frac{1}{2}}$ is the time to reach one half of the plateau activity. The same formula is repeated in the legend of Fig. 1. According to the author this equation was derived by integrating

$$N = N_F\,(1 - e^{-\lambda t})$$

The author's result is erroneous. The correct result of the integration is

$$\text{Area} = N_F\left(t - \frac{T_{\frac{1}{2}}}{0.69}\right)$$

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The author Dr. Razzak agrees with this observation. He states, "This does not entail any other correction in the numerical figures given in the paper."

Editor

TO THE EDITOR:

Reference is made to the method of extrapolation of precordial counting curves as suggested by Gorten and Hughes (1). I agree that a semilog replot of the downslop of the primary circulation curve is tedious, and that direct extrapolation of the original curve by visual inspection, with or without the aid of a French curve is, as they said, "not considered to furnish