Letters to the Editor

Radiation Dosimetry from Breast Milk Excretion of Iodine-123

TO THE EDITOR: Although Hedrick and co-workers (*1*) have presented a well-organized study of tracer excretion in breast milk, they have calculated their radiation dosimetry for iodine-123 (^{123}I) excretion as if the tracer were pure. Currently available ^{123}I(p,2n) is guaranteed at calibration to contain no more than 4.8% ^{124}I*, and even the "clean" ^{123}I(p,5n) may contain as much as 1.9% ^{125}I (*2*).

Romney et al. (*3*) also recently presented a model of ^{123}I milk excretion to determine how long to discontinue nursing. Although they similarly disregarded the effects of ^{124}I or ^{125}I impurities, a dual exponential model of excretion of ^{131}I in milk was presented that can be extrapolated to other long lived iodine isotopes that may be found in breast milk.

More data are needed to accurately characterize the excretion pattern of longer lived isotopes of iodine. The true biologic half-life of iodine isotopes presumably lies somewhere between that of Hedrick ($T_{1/2}$ = 10.4 hr) and that of Romney ($T_{1/2} = \infty$).

NOTE

*Sodium iodide ^{123}I product information, Medi-Physics, Inc., Emeryville, CA.

References

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REPLY: The absorbed dose to the child's thyroid from iodine-123 (^{123}I) excreted in the breast milk was calculated using the assumption that the ^{123}I was pure (*1*). Consideration of the radiocontaminants will cause an increase in the thyroid dose estimates. However, the largest component of the dose would still be delivered as a result of the ingestion of milk in the first 24 hr following administration of the radiopharmaceutical.

In the model by Romney (*2*), the plasma and breast milk activity are described by a pool of activity with a certain concentration which decreases by physical decay. The act of nursing the child, which removes a high fraction of the pool each day, is ignored. Also ignored, apparently, is the experimental data which show that the excretion of radioiodine in human milk is very rapid and a large fraction of the administered activity is excreted in the mother's urine (*3,4*).

The thyroid dose estimates per unit ingested activity are 36 rad/μCi and 30 rad/μCi for ^{124}I and ^{125}I, respectively. These dose estimates were calculated according to the schema of Loevinger and Berman (*5*). Values of the absorbed fractions were obtained from tables of absorbed fractions for small unit-density ellipsoids surrounded by a scattering medium calculated by Ellett and Humes (*6*). Total equilibrium dose constants were calculated from the work of Dillman and Von der Lage (*7*). The thyroid mass of the newborn was assumed to be 1 g. The cumulated activity was determined for a thyroid uptake of 50% (*8*) by extrapolating the biokinetic data for the adult presented in MIRD Dose Estimate Report 5 (*9*).

These dose estimates are a sensitive function of thyroid mass and the thyroid uptake. The assumptions made in the dose calculations are most appropriate for neonates and therefore, will overestimate the absorbed dose values for older infants because of their rapid growth and decrease in thyroid uptake. This results in a conservative recommendation that breast feeding should be discontinued for 1.5–3 days following administration of currently available ^{123}I that contains contaminating ^{124}I and ^{125}I.

References

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