REPLY: The letter written by Peters et al. can be divided in two parts. The first part is directly related to the problem discussed in our paper, namely background correction; the second part is related to an important point in quantification of the separate renal function, namely the errors inherent to the use of a heart curve as a representation of the true plasma disappearance curve. This problem was, however, not the subject of our paper.

The renal background is a composite, with variable proportions of interstitial and vascular components in each organ. We have underlined the fact that from anatomic and angiographic data it is well known that the vascular component in the kidney area is higher than in the peri-renal area and that this component is lower in the subrenal area than in the peri-renal area. On the other hand, it seems reasonable to assume that the interstitial components in the peri-renal area, the renal area, and also the subrenal area are not very different. During these last years, several variants of the algorithm used for the calculation of the renal clearance have been published, allowing a better separation between interstitial and vascular components of renal background (*1,2*). It was, however, still mandatory to evaluate how the different algorithms combined with the different background ROIs would affect the renal clearance, the respective amounts of vascular and interstitial components being differently calculated using one or another method. We have shown, for instance, that in using a simple surface ratio for background correction one is considerably underestimating the renal clearance when the background area is drawn in the subrenal area. This underestimation disappears when one is using the double-correction algorithm.

In the second part of their letter, Peters et al. underline the fact that the external recorded heat curve is not a good representation of the plasma disappearance curve because of the interstitial diffusion of the tracer. This is a well known problem and has been the subject of several papers (*3,4*).

Until now, no satisfactory solution has been proposed to improve the quality of the heart curve. There is no agreement about the way the interstitial component should be corrected, about the best ROI representing the interstitial component in the cardiac area, and about the amount of the activity in this area to be subtracted from the cardiac curve. Apparently, Peters et al. did not solve the problem by correcting the cardiac curve by means of the lung curve. The technique of scaling a ROI below the kidney, proposed by Fleming for hippuran (*3*), has not been successful in our hands using ^{99m}Tc-DTPA, because the scaling factor is essentially variable from one patient to another (*5*). Further work is needed to solve this very real problem.

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Thyroidal Absorbed Dose from a Standard Five-Millicurie Iodine-131 (185 MBq) Dose for Thyrotoxicosis: Cure Can Occur with Less than the Conventional 7000 Rads

TO THE EDITOR: In the treatment of hyperthyroidism with radioiodine, the primary aim is to control the disease. For this, the importance of the delivered dose has been emphasized and treatment conceptualized in terms of estimated units of absorbed radiation. It has been suggested that the administered amount of radioiodine should deliver an ideal radiation dose of 6000–7000 rads (60–70 Gy) and 7000 rads is regarded as a conventional dose (*1–3*). However, individual dosimetry is rarely carried out in these patients since determination of the precise radiation dose required for specific physiologic effects is difficult, if not impossible. The quantitation of the radiation absorbed dose has its own practical problems. It requires a knowledge of a combination of physical and biologic parameters and, in most of the cases, the biologic parameters are only approximately known or assumed. For this and other reasons, the calculation of radiation absorbed dose is merely an estimate.

A variety of different approaches and dose strategies exist in the practical and technical use of radioiodine, however, such differences appear only to alter the proportion of early to late hypothyroidism and the rate at which a response is achieved. We have found by experience that no particular strategy for determination of the number of millicuries to be administered for therapy has any overwhelming advantage in minimizing subsequent hypothyroidism. As a result, we used the simplest and least cumbersome method by giving a "standard" dose of 5 mCi ^{131}I (185 MBq).

If we are to go by the absorbed dose recommendations mentioned in literature, then it should follow that those of our patients who had absorbed doses below this "ideal" should be uncontrolled and those who received doses above this should be rendered rapidly hypothyroid.

We calculated the absorbed dose to the thyroid from a standard 5-mCi (185 MBq) dose of radioiodine by the MIRD schema (*4*) in 61 patients with thyrotoxicosis. To determine the parameters viz. biologic half-life and mass of the thyroid gland for the calculation of the absorbed dose, all 61 patients were given a tracer dose of 25 μCi ^{131}I (925 KBq) capsule each. Postadministration of this diagnostic dose, the mean thyroid counts were calculated for 100 sec with and without shield at 2, 24, 48 and 72 hr and if necessary for more than 72 hr using a 3 × 5-inch NaI scintillation detector fitted with a 15° flat-field collimator assembly (*5*). The percent radioactive iodine uptake (RAIU) in the thyroid was determined by comparing the thyroid counts with those from a known

TABLE 1
Thyroid Response and Absorbed Dose (5 yr After Standard 5-mCi ^{131}I Dose for Thyrotoxicosis)

Dose delivered (rads)	Euthyroid (n = 26)	Hypothyroid (n = 16)	Uncontrolled (n = 19)
<3000 (n = 13)	5 (19.2%)		8 (42.1%)
3000–6000 (n = 23)	13 (50.0%)	3 (18.75%)	7 (36.8%)
>6000 (n = 25)	8 (30.8%)	13 (81.25%)	4 (21.1%)*

* These four patients had received an absorbed dose of 10,000–11,000 rads (100–110 Gy).

amount of radioactivity in a tissue equivalent phantom. The biologic half-life of radioiodine in the thyroid was determined from a graph of RAIU versus time period on semilog paper. The thyroid gland mass was measured from the rectilinear scan using the formula described by Goodwin et al. (*6*).

At 5 yr post-treatment, 26 patients were euthyroid and 16 were hypothyroid. Nineteen patients were not controlled with this dose. Thus, 42 of the 61 patients showed a positive response (cure).

We have found that absorbed doses well below the stated ideal of 7000 rads (70 Gy) produced a positive response in half of the patients successfully treated (Table 1). Five patients were euthyroid although the absorbed dose in their case was less than 3000 rads (30 Gy) and three were hypothyroid with absorbed doses between 3000–6000 rads (30–60 Gy). Interestingly, it was seen that absorbed doses of more than 10,000 rads failed to control the disease in 4 of the 19 patients who did not respond to this single 5-mCi ^{131}I dose.

Basic to all thyroidal response to radioiodine is the question of individual radiosensitivity, a factor as yet totally unidentified and unmeasurable. Obviously patients' responses to radioiodine are not predictable and the factors determining them are probably unknown. Calculated doses are no more accurate than random fixed doses and, in the consideration of an "ideal" absorbed dose, the "conventional" 7000 rads figure does not appear in our findings to be universally applicable.

How does one ultimately decide on a suitable dose of radioiodine? Is there no other recourse available to the treating physician except to fall back on individual experience over several years with one or other schedules of treatment?

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