the flow curve of parotid and submandibular glands by region of interest technique before and after stimulation.

We believe our method (*3–5*) is easier to perform than the reported clearance technique (*1*) and that it allows a separation of normals and patients with salivary gland disorders (Fig. 2); not only in Sjögren's syndrome but also in other disorders, e.g., acute inflammations, chronic diseases and excretion disorders. We have also demonstrated the efficiency of our method for follow-up studies after therapy (*5,6*).

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W. Becker
W. Börner
W. Spiegel
CHR. Reiners
Abteilung für Nuklearmedizin der Universität
8700 Würzburg, FRG

REPLY: Becker's analysis of our study (*1*) is erroneous and further clarification is offered.

Clearance may be defined in the following way (*2*):

$$\text{cl(ml/min)} = \frac{\text{TEA}}{\int_{t_1}^{t_2} \text{Pdt}} = \frac{\text{TEA}}{\bar{p}\text{xT}}, \qquad (1)$$

where TEA = Total excreted activity;
Pdt = Plasma concentration over time;
p = Mean Plasma concentration during the time (T) of collection;
t_1 = Start of collection;
t_2 = End of collection; and
$t_2 - t_1 = T$.

Becker seems to imply that compartmental analysis is required to obtain the denominator $\int_{t_1}^{t_2} \text{Pdt}$ ($=\bar{p}\text{xT}$) of the clearance formula. This is not correct. In the case of a finite collection, such as 10 min of saliva, this factor, $\int_{t_1}^{t_2} \text{Pdt}$, simply equals the area under the plasma activity curve during the time of collection ($t_1 \rightarrow t_2$). This area can alternately be represented as $\bar{p}$xT (Fig. 1). The shape of the plasma activity curve and thus the number of compartments that contribute to it is irrelevant. The curve is either integrated directly and the TEA/$\int_{t_1}^{t_2}$ Pdt clearance formula is used, or if the mean plasma concentration can be determined independently, the TEA/$\bar{p}$xT formula is used.

Compartment analysis is used in the clearance formula:

$$\text{cl(ml/min)} = \frac{\text{TEA}}{\int_0^{\infty} \text{Pdt}} = \frac{\text{Dose}}{\int_0^{\infty} \text{Pdt}} \text{ (by } \infty\text{, whole dose = TEA)} \qquad (2)$$

In this case, the curve cannot be integrated directly (to time infinity) and compartment analysis allows one to extrapolate the curve to infinity for subsequent mathmatical integration.

We studied ten patients in whom saliva collections were obtained with the heart positioned before a scintillation camera in order to derive a cardiac ($\cong$ plasma) activity curve. Direct curve integration provided the same result as did the midpoint blood value ($y = 1.00375$, $r = 0.999983$) in the calculation of clearance. Therefore, we use the mid-point blood value for $\bar{p}$ as described in our article (*1*).

Finally, we explained in our discussion some of the pitfalls of semiquantitative (ROI) methods. Consider the following: Patient A has an effective volume of dose distribution twice that of Patient B. Both patients have the same clearance. Following the dose, Patient B will initially have a higher blood concentration, a higher excretion rate (mCi/min) and therefore a more rapid elimination of tracer. Patient A with an expanded volume of distribution will have a lower initial blood concentration, lower excretion rate and, therefore, a slower tracer elimination. The momentary concentration of tracer in the glands is dependent on the dose, the plasma concentration, the clearance rate, and the salivary transit time. Although the two patients' salivary function is the same, the curves for the two patients would be grossly different (Fig. 2).

Without elaborating in detail, it is obvious that other organs that compete with the salivary glands for pertechnetate uptake will alter the plasma concentration and thus the salivary concentration of tracer. Thus, a Graves' disease patient may reduce the available tracer so rapidly that the salivary uptake is minimal. The clearance will not be affected except as Graves' disease affects the clearance itself.

All of these considerations apply similarly to renal scintigraphy and to glomerular filtration rate (GFR) and ERPF determination methods and have been addressed recently by Jackson et al. (*2*).

Salivary scintigraphy is best evaluated by all modalities available including visual inspection of scintigrams, use of semiquantitative aids such as region of interest-grams and finally clearance measurements. To dismiss salivary clearance in favor of a qualitative curve is as to dismiss the GFR and ERPF in favor of diethylenetriaminepentaacetic acid and hippurate renography. All are useful and helpful in the right hands.

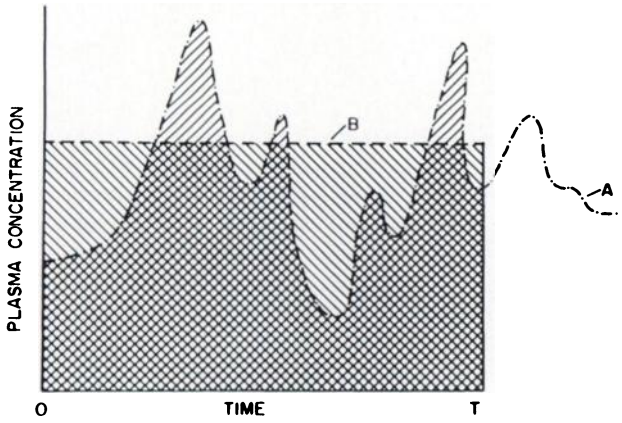

FIGURE 1
Curve A (- • -) is plasma activity curve. Area under this curve from 0 → T (Area A; ▨) = $\int_0^T P dt$. Curve B (- - -) is mean plasma activity curve. Area under this curve from 0 → T (Area B; ▧) = $\bar{p}xT$. Area A = Area B. Therefore either Area A or area B may be used in clearance formula (see text). This figure graphically demonstrates that actual plasma concentration can vary widely and that compartmental analysis is not needed to calculate clearance by our method

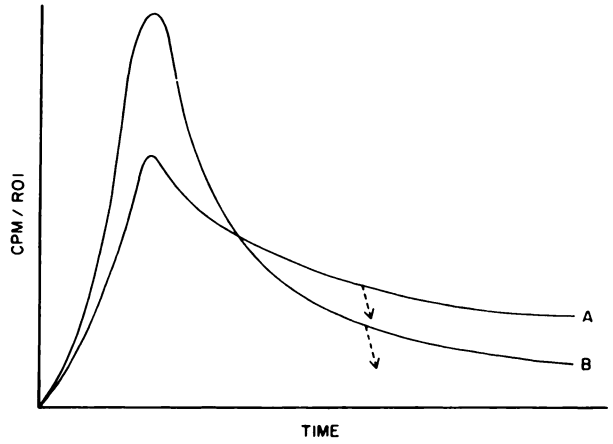

FIGURE 2
Projected salivary gland activity curves for Patients A and B as designated in text. Note rates of uptake, peak uptake, and rates of washout are different for two patients with same clearance who are otherwise identical except for volume of distribution. Arrows (- - →) project effect of lemon juice

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Peter W. Blue
John J. Jackson
Nuclear Medicine Service
Fitzsimons Army Medical Center
Aurora, Colorado

Efficacy of the Four-Hour Radioiodine Uptake Determination Prior to Radioiodine Therapy for Hyperthyroidism

TO THE EDITOR: We agree with Floyd et al. (*1*) that the 4-hr radioiodine uptake provides a clinically useful and logistically advantageous measure of thyroid function and have employed this interval as the standard in our laboratory for more than 15 yr, using an upper limit of normal of 20%. However, we do not agree that the 24-hr value needs to be obtained on all potential therapy patients. We have found the 4-hr value to provide adequate information in the vast majority of patients (>90%) referred for radioiodine therapy for hyperthyroidism. This 4-hr value has been used in our laboratory to assist in determination of therapy dose with resultant control of hyperthyroidism in >75% of patients with one dose and with approximately a 35% incidence of hypothyroidism at 10 yr. These figures compare well with those reported from other institutions using the 24-hr value in dose determination (*2*). Only those patients whose 4-hr values are not clearly elevated but who are clinically suspected of hyperthyroidism are asked to return for a 24-hr value prior to therapy. In our practice, this occurs infrequently.

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Robert J. Cowan
James D. Ball
Nat E. Watson
Bowman Gray School of Medicine
Winston-Salem, North Carolina