circular free levels. In a recent publication, Vining et al. reached
the same conclusion, although their T4 assay lacked the sensitivity
to measure salivary T4 accurately (2).

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REFERENCES
1. ELSON MK, MORLEY JE, SHAFER RB: Salivary thyroxine
as an estimate of free thyroxine: Concise communication. J
2. VINING RF, McGINLEY RA, SYMONS RG: Hormones in
saliva: Mode of entry and consequent implications for clinical

Re: The Derivation of the Gamma-Variate
Relationship for Tracer Dilution Curves

Mr. Davenport should be commended for his elegant derivation
of the gamma-variate function for indicator dilution curves (1).
I have, however, one minor question: Pursuant to Eq. 18, the
statement is made, “Since the total amount of tracer injected at
the beginning of the vessel is assumed to be unity, we must have
\[
\int_0^\infty C(\alpha, \beta, t)dt = 1 \ldots
\]
However, since the quantity \( C(\alpha, \beta, t) \) is a concentration, should
not the integral extend over a volume that in turn is evaluated at
t = 0? Perhaps the author should have said that, by convention,
the area under the gamma variate is taken to be unity.

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REFERENCES
1. DAVENTON R: The derivation of the gamma-variate relationship for tracer dilution curves. J Nucl Med 24:945–948,
1983

Reply

Dr. Harpen is correct in pointing out that Eq. (18) refers to a
concentration rather than an amount. There are a couple of ways
of resolving this discrepancy. One is to stipulate that the area under
the curve be unity, as Dr. Harpen suggests. Another would be to
multiply by the volume of distribution, \( V \), and set the product equal
to unity. Since the initial amount of tracer injected at \( t = 0 \) is di-
luted in the volume, \( V \), of a theoretical mixing chamber, the result
would be the same.

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Re: New Perspectives in Localizing Enlarged
Parathyroids by Technetium-Thallium Subtraction
Scan

We read with great interest the recent report by Ferlin et al. (1)
on imaging parathyroid adenomas by combined technetium and
thallium subtraction scans. The relatively noninvasive nature of
the combined scanning technique, with its high success rate, offers
an attractive imaging modality in these patients. Previous imaging
modalities—including barium esophagograms, thyroid angiography,
and venous sampling for parathormone levels—have all had varying success rates in locating parathyroid adenomas. Recently,
higher success rates have been achieved with high-resolution TCT
scanning and high-resolution ultrasound scanning. Intravenous
digital subtraction angiography (i.v. DSA) may also prove to be a
useful adjunct in parathyroid imaging. Levy et al. reported i.v.
DSA to be positive in six of seven patients (2). Patient selection
may have been responsible for this high success rate. We have
evaluated a prospective, consecutive series of 13 patients with
parathyroid adenomas, and i.v. DSA identified only four.

In view of these difficulties in imaging parathyroid adenomas,
Ferlin's results seem encouraging. We utilized their combined
scanning technique to locate correctly a 4-g parathyroid adenoma
in a patient with persistent elevated calcium and PTH levels (Fig.
1). However, in reviewing the Methods and Materials section of
their paper, we noted that their patients were first given 1 mCi of
pertechnetate and then given thallium. From a purely tech-

FIG. 1. Thallium pinhole thyroid scan shows increased uptake in right lower pole of thyroid (left). Tc-99m pertechnetate scan shows
small defect in same area (center). Subtraction image confirms presence of thallium-avid nodule at lower pole of right lobe of thyroid
(right). Surgery confirmed 1.5-cm parathyroid adenoma in this area.

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