Considering these above studies, IDEC-Y2B8 has an overall response rate comparable with other anti-CD20 products such as ^{131}I-B1 reported by Press et al. (*6*) and Kaminski et al. (*7*) in the original article.

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Accuracy of Estimation of Glomerular Filtration Rate from Renography

TO THE EDITOR: The estimation of glomerular filtration rate (GFR) from measurement of the absolute uptake of activity in the kidney is a useful enhancement to radionuclide renography, allowing information obtained on the individual kidneys to be interpreted in the context of overall renal function. This process requires the depth of the kidney to be assessed, and lateral images obtained at the end of the renography acquisition have been used for this purpose (*1*). At our own center the use of lateral images has been shown to improve the precision of GFR estimation from renography compared with the use of equations (*1*), although the difference was not statistically significant. The study described in Steinmetz et al. (*2*) contains some useful new ideas on using lateral images in GFR quantification, in particular the use of the centroid of the renal region of interest. It also confirms the improvement in precision achieved through use of lateral images in determining kidney depth. However, despite this increase in precision I believe that it is wrong to conclude that this refinement brings the technique into the precision range of blood sample based methods.

The first reason that Steinmetz et al. cannot make this conclusion is that there are weaknesses in their methodology. They have compared their GFR estimates with creatinine clearance which itself is an inaccurate estimate of GFR (*3*). They also have used the correlation coefficient as the measure of agreement between their estimates of GFR which is an inappropriate statistic in this instance (*4*). SEE is a more appropriate parameter and is the one used by most previous investigators in this field. Standard errors for blood sample GFR are of the order of 3–4 mL/min (*1*). Visual interpretation of the graph showing the data of Steinmetz et al. would suggest a standard error considerably greater than this.

The second reason for rejecting their conclusion is that the errors inherent in the technique mean that it would never be expected to have a precision equal to blood sample techniques. The error of 3–4 mL/min expressed as a percentage error is around 5%–7% on a typical population of GFR measurements. Such a percentage error would not be expected in gamma camera GFR measurement for the following reasons:

1. The cumulative uptake measured at 2–3 min in renography is proportional to the average GFR over a very short period of time. By contrast blood sample GFR gives a value averaged over a period of several hours which, therefore, will be much less subject to short-term physiologic variability than the renogram measurement.
2. There is a considerable contribution to the counts obtained in the kidney region from both extrarenal and intrarenal background. Although there are methods for subtraction of both components of background counts these are not perfect and have a random error associated with them (*5*).
3. There are significant errors in performing depth measurements from lateral images obtained at the end of the dynamic phase of renography. The visual outline of the kidney region at this time may not be the same as that which would have been obtained at 2 min. This is particularly the case when there is significant hold up in a dilated pelvis. The appearance also may be confused by contribution from the contralateral kidney. Again, this will be more marked in kidneys with delayed transit. There is also difficulty in defining the posterior border, although this will be subject to less error when using a supine position as described by the authors than when using seated or semirecumbent positions. If a depth precision of ± 1 cm is achieved, the corresponding error in renal activity measurement is about 12.5%.

The combination of all these sources of error will almost certainly lead to a precision of greater than the 5%–7% achieved by blood sampling. Previous studies have shown a variety of precision, with the best results claiming SEE of approximately 11–13 mL/min (*1*), which corresponds to 18%–22%.

Although the use of absolute measurements of percentage uptake in renography and their relation to GFR is clinically useful, the method does not produce such precise values as blood sample measurements and should not be used as an alternative when an exact figure is required.

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REPLY: We wish to thank Dr. Fleming for his interest in our article and his constructive remarks. It is true that creatinine clearance has limited accuracy for estimating the glomerular filtration rate (GFR) but it is still the widely used method due to its availability. The overwhelming majority of clinical decisions are based on the creatinine clearance test (CCT) or simply the serum creatinine value. This is one of the reasons why Gates (*1*) and others compared gamma-camera-based GFR estimates to CCT and not to the gold standard methods, such as inulin or ^{51}Cr-ethylenediaminetetraacetic acid clearance. In our case, the choice of CCT as a reference was predetermined by the initial scope of the study: to validate Gates' method on Elscint gamma cameras and software.

Although we acknowledge that the standard error of estimate (Sy.x) is a more appropriate measure of correlation, it still can be misleading if reported alone. For example, in the simple linear regression procedure we performed comparing CCT with GFR (that we estimated with measured depth correction) in the 14 patients presented in Table 2 (*2*), we obtained a correlation coefficient of $r = 0.87$ with an Sy.x of 10.1 mL/min. When CCT is correlated with the GFR values obtained with the original Gates method (which doesn't measure renal depth, but only estimates it by Tonnesen's formula), $r = 0.51$ and Sy.x = 17.3 mL/min were obtained. This result is worse than the 7 mL/min value published by Gates (*1*). Thus, there is no doubt that the modifications we introduced improved the correlation with CCT, yet the Sy.x in our study has a higher value than in Gates' original study.

We agree that a GFR estimate based on diethylenetriamine pentaacetic acid (DTPA) renal uptake over a short period (between 2–3 min after injection) represents the GFR for only that point in time, but it has proven highly efficient and is widely accepted including in Gates' study—and may be potentially advantageous when studying GFR under pharmacologic interventions such as captopril.

The renal contour should be reliably depicted on lateral views by 20-min post-DTPA injection with some operator experience. The fact that the kidney outline is not the same as it would have been obtained at 2 min, doesn't actually affect locating the geometric center of the renal region of interest (ROI). Our precision of renal depth measurement in the supine position was better than ±1 cm (approximately ±0.5 cm). To obtain these results, certain hardware is required, and some rules are to be observed: lateral views should be acquired in a 256 × 256 matrix (1.6 mm/pixel for a 40-cm field-of-view camera), and the computer must have adequate contrast enhancement and zoom controls to adjust the picture quality so that renal contour and posterior body contour are well visualized. Before any renal depth measurement is performed, the posterior views in the last few frames of the renal dynamic scan should be examined for potential pitfalls as hydronephrosis, missing kidney, etc. Severe tracer retention in one kidney may appear on the lateral view of the other kidney and should be excluded from the lateral renal ROI.

We too believe that GFR determination by tracer disappearance using multiple blood samples is more precise than gamma camera-based methods. The statement that modifying Gates' technique improves its precision to the range of blood sample-based methods refers, rather, to other gamma camera-based methods, some of them using one blood sample at the end of acquisition (*3–5*). We appreciate Dr. Fleming's comments to clarify this point and to bring it to the attention of the journal's readers.

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Mouse Models for Internal Radiation Dosimetry

TO THE EDITOR: The article by Muthuswamy et al. (*1*), "A Mouse Bone Marrow Dosimetry Model," referred to prior work by Hui et al. (*2*) in ways that may have misinterpreted the purpose and discounted the usefulness of our earlier (and simpler) mouse dosimetry model. Muthuswamy et al. described our work as "a model . . . for ^{90}Y mouse bone marrow dosimetry that does not assume local energy deposition of β particles that are emitted inside the marrow . . . this model also computed the dose to marrow from the rest of the mouse body."

It would have been more correct to describe our mouse model (*2*) as a useful tool for calculating β-particle doses to the relatively small volumes of mouse organs and tissues. Our mouse model accounts for β energy absorbed fractions from the activity in small organs and tissues, as well as from the cross-organ β irradiation of organs or tumors by activity residing in adjacent tissues. It also accounts for changes in organ mass over time. The cross-organ dose component in the mouse is particularly important for the high-energy β emitter ^{90}Y, as shown by Beatty et al. (*3*). For example, a substantial contributor to marrow dose is the β-particle dose from ^{90}Y activity deposited on adjacent bone surfaces (*2*). Our model also was extended to other radionuclides, such as ^{131}I and ^{186}Re. These features make our mouse model well suited for experimental radioimmunotherapy studies (*4*).

Muthuswamy et al. attempted to improve on one aspect of our approach by calculating the dose to various regions of the total-body marrow, rather than to merely femoral marrow, as in Hui et al. (*2*). However, Muthuswamy et al. did not show how one would actually determine activity concentrations in those various marrow regions. In addition, they did not include the cross-organ