by Eq. (1a) for $B + C = 0$ is

$$R = \frac{DA}{A_E} \cong D\left(1 + \frac{2}{A\mu(E)}\right) \qquad (2)$$

which accounts for septal penetration at the edges of the collimator holes.

A comparison of the resolution calculated from each result is given in Table 1. (For a detailed explanation of the origin of the collimator parameters given in Table 1, see Ref. *1*.) It is seen that for a collimator designed for high-energy gamma rays (≧400 keV), the error in the resolution is 10% or greater for small source-to-collimator distances. This error is reduced for lower energy gamma and large source-to-collimator plus collimator-to-detector distances.

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FOCAL HYPERFIXATION OF RADIOCOLLOID BY THE LIVER

In recent years, several cases of focal hyperfixation of radiocolloid in the liver scan have been presented in the *Journal of Nuclear Medicine*. The reason for this hyperfixation could not be determined in most cases. We observed one with a "hot spot" in the liver scan which could be examined histologically.

A 37-year-old female patient consulted her physician for discomfort in the epigastrium. At physical examination there was a clearly delimited round and palpable mass. Blood chemistry revealed no pathologic findings except for a slight rise in alkaline phosphatase and SGOT. The patient was referred to us for a liver scan, which showed a hot spot, corresponding to the palpable tumor in the epigastrium. Angiographic examination was suggestive of a tumor in the liver (Fig. 1). Therefore, the patient was operated on and left lobectomy was carried out. The pathologist found a well-defined tumor with a diameter of 6 cm in the left lobe of the liver. Histologically, the tumor consisted of normal liver tissue with moderate fibrosis. Histologic diagnosis: hamartoma in the left lobe of the liver.

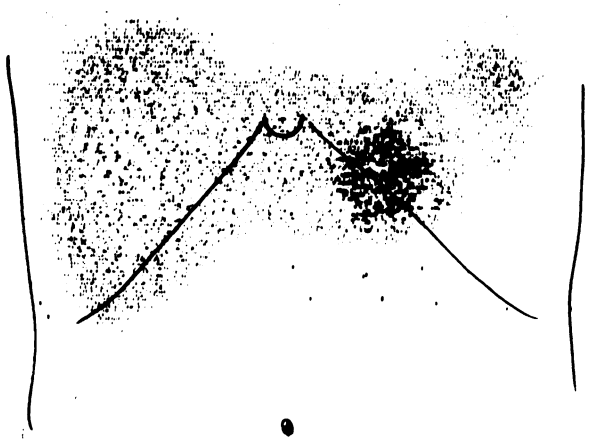

FIG. 1. Angiographic examination suggestive of liver tumor.

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EXPRESSION OF TISSUE ISOTOPE DISTRIBUTION

When tissue-distribution studies of labeled compounds are reported, the common method of expressing individual tissue concentration is as percent of administered dose per gram of tissue. To be meaningful, the size of the animal must be stated, since, obviously, a large animal will constitute a larger dis-

tribution volume than a small animal. It is therefore very difficult to conceptualize various tissue concentrations in different animals using this mode of expression.

Based upon many distribution studies in our laboratory (*1,2*), we have found it much more useful to express individual tissue concentrations as percent of mean body concentration, making the assumption that all of the radionuclide is still in the body. This calculation requires the following steps: counting a weighed aliquot of the injected solution, weighing the injected solution, weighing the whole animal, and weighing the portion of the tissue counted. All of these parameters are incorporated into the calculation:

$$\% \text{ Mean body concentration} = \frac{\text{cpm/gm tissue}}{\text{injected cpm/gm total animal}} \times 100$$

This mode of expression allows simple conceptualization of tissue distribution of any tissue of any animal. For example, if the tracer distributed uniformly throughout every gram of the animal, then all tissue concentrations would be 100. I wish to suggest that other investigators consider the merits of this method.

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A COMMENT ON THE POSSIBILITY OF ^{99m}Tc-SULFUR COLLOID RETENTION IN THE LUNGS

Having read the two articles in the *Journal* (*1,2*) concerning retention of ^{99m}Tc-sulfur colloid in the lungs, I would like to make the following comments on the significance of colloid particle size and stability.

The change from retention in the liver to retention in the lungs takes place at a particle size of about 5–10 microns, i.e., a product such as ^{99m}Tc-sulfur colloid with a particle size of about 1 micron has only a small safety margin before the particles are too large.

The colloidal state exists when particle size varies from that of a true molecular solution to that of a suspension. When the particle size of a colloid becomes larger than 0.1 micron the compound can no longer be called a colloid; among other things, the solution becomes opalescent (milky) and the particles will settle on standing. The formation of ^{99m}Tc-sulfur colloid starts with a colloid of small particle size. However, because of the relatively large instability the particles grow quickly to a size ($\simeq$1 micron) at which the distance between particles becomes so great that the particles are stabilized to some extent. The final sulfur colloid product is opalescent and the particles settle on standing; the product must therefore be considered quite unstable.

The possibility that sulfur colloid in certain special conditions could have flocculated during or after injection cannot therefore be ruled out. A true colloid, both with a smaller particle size and a greater stability, could be used to investigate this possibility.

True colloids for liver scintigraphy include, for example, ^{198}Au-colloid (used previously) and ^{99m}Tc-antimony sulfide colloid (*3–5*). The latter is easy to produce and is stable for at least 1 year.

In an investigation into whether ^{99m}Tc-antimony sulfide colloid under special circumstances is retained in the lungs, I recommend that the colloid be filtered through a Millipore filter (0.22 micron) in order to remove the smaller amounts of larger antimony sulfide particles which are nevertheless formed during production of antimony sulfide colloid. Normally this filtration is not necessary.

Finally, I would like to point out that antimony sulfide colloid is commercially available as a single-bottle kit from Philips-Duphar.

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