Re: Optimal Handling of Dimercaptosuccinic Acid for Quantitative Renal Scanning

The recent article on optimal handling of dimercaptosuccinic acid (DMSA) raises certain important clinical points (*1*). The preparation of the Tc-99m DMSA pharmaceutical is critical. Undue delay between the preparation and administration of the substance results in decreased uptake in the kidneys. This finding has been explained by some investigators as being due to simple oxidation, and by others to pH variance and stannous-stannic oxidation. To minimize these effects we have used a strict preparation protocol. We milk the Tc-99m from the generator with a small-volume vial of isotonic saline originally under vacuum with an airlock needle above the level of the saline, avoiding the possibility of bubbling air through the saline. If additional saline is needed, we use either saline under vacuum or boiled saline that has been cooled to room temperature immediately before use. The radiopharmaceutical is injected as soon as possible after preparation.

These simple precautions significantly improve the imaging of the kidneys, and are mandatory for serial quantitative comparison.

DEREK ENLANDER
St. Luke's Roosevelt Hospital Center
New York, New York

REFERENCE

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Re: Exercise Lowers Thyroid Radioiodine Uptake: Concise Communication

Hooper et al. (*1*) have observed a decreased uptake of radioiodine in exercising rats and human subjects, compared with nonexercising controls. They conclude from their observations that the uptake of stable iodine is likewise reduced in exercising subjects relative to nonexercising controls, and wonder about the consistency of a reduced thyroid uptake with the observations of Irvine (*2*), and Terjung and Winder (*3*), that exercise causes an increase in the turnover of T_4 and T_3. However, the data presented by Hooper et al. (*1*) neither support nor contradict their conclusion.

Johnson (*4*), Ramsden et al. (*5*), and others have shown that the uptake of radioiodine is a sensitive function of the dietary intake of stable iodine. Not only is the average daily intake of stable iodine important, but because of short biological half-life of inorganic iodine in blood (~0.25 days in adult man), the time relationship between the intake of radioiodine and stable iodine is also important.

For nonexercising and exercising subjects, Hooper et al. (*1*) give dietary iodine as 380 ± 156 μg/day and 440 ± 190 μg/day, respectively, with corresponding percentage uptakes of I-123 of 14.3 ± 5.1 and 8.0 ± 2.8 at 24 hr. To demonstrate that these numbers are consistent with the hypothesis that there is no difference in thyroid uptake between exercising and nonexercising subjects, let us assume that the dietary iodine is taken in at a constant rate, that dietary iodine is proportional to inorganic iodine in the blood, and that the usual assumptions about the normal distribution of data and independence of variables hold. With these assumptions, the uptake of stable iodine can be calculated by (*4*)

$$U_S = \frac{1}{100} S \cdot U_r \pm (S^2 \cdot \Delta U_r^2 + U_r^2 \cdot \Delta S^2),$$

where $S \pm \Delta S$ is the daily dietary iodine and $U_r \pm \Delta U_r$ the percentage uptake of radioiodine given by Hooper et al. (*1*). This equation yields daily stable thyroid uptakes of 35.2 ± 19.6 and 54.4 ± 29.5 μg for exercising and nonexercising subjects, respectively. These values are not statistically different. Insufficient data are available for a similar analysis for rats.

The assumptions made above will not hold in general, and it is likely that their use tends to decrease the calculated uncertainty in the uptake of stable iodine. Uptake from food will not be constant but will occur in several "pulses" each day, and this pattern may differ between exercising and nonexercising subjects. Exercising and nonexercising subjects may differ in their excretion rate of inorganic iodine from blood, and if so they will vary in the relationship between dietary iodine and inorganic iodine in blood, and hence in the relationship between dietary iodine and radioiodine uptake. In addition, the assumption of independence between dietary iodine and thyroid uptake is certainly not valid, although whether or not they are independent in a statistical sense depends on whether or not the uncertainties quoted by Hooper et al. (*1*) result from experimental error or individual variability.

J. R. JOHNSON
Chalk River Nuclear Laboratories
Chalk River, Ontario

REFERENCES

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4. JOHNSON JR: Radioiodine dosimetry international symposium on radioiodines, Banff, Alta, Canada, Sept. 1980. Proceedings published in *J Radioanal Chem*. In press

5. RAMSDEN D, PASSANT FH, PEABODY CO, et al: Radioiodine uptakes in the thyroid. Studies of the blocking and subsequent recovery of the gland following the administration of stable iodine. *Health Phys* 13:633–646, 1967

Reply

Dr. Johnson questions our inference that the observed decreased uptake of radioiodine in exercising rats and human subjects is paralleled by a decrease in uptake of stable iodine. This inference is based on data published in 1967 (*1*), which showed that exercising rats had decreased total thyroidal iodine compared with control rats. In this experiment, iodine intakes were held constant for both groups of animals. The experiments in which radioiodine uptake was measured were carried out using identical experimental conditions, but at separate times. If we combine the data reported earlier with the recently reported radioiodine uptake values, we can calculate the uptakes of stable iodine. These are shown in Table 1. If the data are normalized by setting the exercised uptake value to 1.0, we can compare the one human experiment with the two rat experiments (Table 2). This shows that in every case the nonexercising group had about 1.5 times the stable iodine uptake of the comparable control group.