

18 September 1959

Theo. C. Panos, M. D.
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 University of Arkansas
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 Little Rock, Arkansas

Dear Dr. Panos:

It was very kind of Dr. Keys to refer you to our work on the determination of fat content of humans.

Some time ago we developed a method involving a complicated machine but simple gas-dilution principle that would be ideally suited to measurements of body volume, and hence density, of infants. A scaled-down and simplified model of the apparatus currently being used for adults could, I am sure, be devised for infants. The accuracy of the device would very likely be something like ± 15 cc (about ± 0.005 g/cc for a 2.5 kg infant). We have not done this, and I therefore hesitate to offer an opinion of cost or the extent to which the existing machine could be simplified.

I do not want to imply, however, that the use of this or any other method for measuring density is the whole solution to the problem of estimating fat in infants. As you perhaps will know, the formulas for estimating depot fat from body density or from total body water are based upon the assumption that water constitutes 73 percent of the lean tissue mass, and that the ratio of protein to bone is 3:1. If the individual differs in these values, the estimate of fat will be in error no matter how precise the measurement of density (sp. gr.) or total body water. From the few measurements of body water that have been made on infants, it seems apparent that the percentage of body water may be substantially greater in the newborn than in the adult, and that it decreases rather rapidly during the first three to six months. This alone would leave conventional methods for estimating fat open to doubt. Their reliability would be further suspect if

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in the infant the ratio of protein to bone mineral differs from that of the adult or undergoes alteration during early growth.

Most of this ambiguity can be disposed of by measuring both the body density and the total body water. The latter can easily be accomplished with tritium-labeled water, since it can be given orally and assayed in urine. However, I would personally be reluctant to give a radioisotope to children solely for test purposes, particularly where repeated determinations are needed.

On the other hand, a simple determination of body density may be adequate for estimates of change in fat content even though the precise percentage of body weight the fat constitutes may be in doubt. The danger here lies in the possibility that if the relative proportions of water, protein, and bone mineral also change indeterminately between measurements, this would, by the nature of the methods, be interpreted as, and indistinguishable from, an alteration in fat content.

Nevertheless it seems to me desirable and entirely reasonable to investigate this approach to estimating fat content of infants. Had we been in a position to do so, we would have undertaken such a study long before this. The gas-dilution method for measuring density is so innocuous to the subject (and parent) that there can hardly be objection on grounds of procedure. It is essentially no different from placing the infant in an incubator for ten minutes. And with the prevailing dearth of reliable information on changes in infant body composition, any data one accumulates should be of value and perhaps of genuine clinical usefulness.

I am enclosing two reprints that bear on the discussion above. If I can be of any further service to you, please do not hesitate to write.

Sincerely yours,

William Siri

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Encl.

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