
Reply to ARP Walker

Dear Sir:

It is gratifying to see that Walker’s letter supports my recent Editorial (1), which pointed out that hunter-gatherer societies are largely free of chronic degenerative diseases despite notable differences in plant-animal subsistence ratios and macronutrient energy patterns. Walker, whose expertise on this topic is widely recognized, expands on this point, discussing the relative freedom from degenerative disease that is characteristic of all pastoral societies in Africa (who consume low-fat diets) and of other rural African populations.

In keeping with his letter’s title, Walker then suggests that, rather than seek health and ill-health lessons from hunter-gatherers, it might be more relevant to study present-day Western populations that vary in their incidence of degenerative disease. I assume that he suggests this because, in the near future, most or all human populations worldwide will probably be Westernized. Thus, regardless of how healthful the hunter-gatherer lifestyle and diet may be, no one will live under such conditions. But, as Walker suggests, if we could determine why some Western populations show less evidence of certain degenerative diseases than do others, we could emulate the more healthful patterns. Walker concludes his letter somewhat pessimistically, noting that, even if such recommendations were forthcoming, current evidence suggests that they would largely be ignored.

The comparative studies that Walker advocates are of considerable value and importance. However, because human biology appears to have altered little over the course of human evolution (most human adaptations having been cultural rather than biological), it seems that casting a wide net would produce a more complete picture. We need to bear in mind that the contemporary Western lifestyle is only an experiment in progress. In contrast, the hunter-gatherer way of life has been time-tested and proven for > 2 million y.

True, we can only speculate about dietary proportions of ancestral hunter-gatherers. But other relevant dietary information can be determined from the fossil record, and our ability to recover such information is constantly improving (2). Archaeological and skeletal remains permit us to trace the changes in human health that accompanied the dietary transition to agriculture and estimate the length of time a population may have used a given plant or animal staple (3). Detailed information about nutrient characteristics of wild foods shows important ways in which hunter-gatherer diets vary from contemporary Western diets (4–6)—and here I am referring not to processed modern foods but to differences in the nutrient content of fresh cultivated compared with wild plant foods and domesticated compared with wild animal foods. Study of hunter-gatherer behavior shows that most hunter-gatherers have a very active, physically demanding lifestyle. In addition, our investigation does not have to be restricted to humans. For example, examination of the natural diets of wild apes and monkeys shows interesting differences between the nutrient patterns of their diets and those of contemporary Westerners (6).

Walker is justly concerned because many people appear to ignore diet-related suggestions that could improve their health and longevity. Research with hunter-gatherers may provide clues as to why people behave in this manner. Although considerable material has been published on the dietary behaviors of some hunter-gatherer societies, quantitative data are generally scant and there is a strong need for more detailed study of this topic while time permits.

It seems that many hunter-gatherer diets consist largely of the same foods each day. Most wild foods are low in energy, and it often requires tremendous effort to secure a sufficient energy reserve. For example, indigenous Amazonians, both men and women, typically devote ≥ 8 h/d to subsistence activities (7). Rare, energy-rich wild foods seem particularly critical for children and women because of the costs of growth and reproduction, respectively. Fat reserves are also necessary to survive seasonal low points in overall food availability (8, 9).

In contemporary Western nations, it makes perfect sense that a well-nourished person who has already consumed sufficient energy for a 24-h period does not need to eat a piece of cake. Why do most of us reach for that cake more or less automatically? Perhaps it is because we are “programmed” through our common evolutionary heritage as hunter-gatherers to be particularly responsive to foods that appear rich in energy (8, 9).

For similar reasons, we can predict that people might show resistance to changing the features of their customary diet, even when such changes would prove beneficial. Smith and Smith (10) compared 3 diets of northwestern Australian Aborigines over the period 1890–1970: their diet as hunter-gatherers, their diet when they lived on cattle stations where some Western staples were available, and their diet in contemporary Aboriginal communities in which Western foods could be self-selected.

Comparison of the 3 diets with a modern recommended diet supported the nutritional adequacy of the hunter-gatherer diet (wild cereal and fresh plus dried fruit with a moderate amount of meat). However, there was a common link among the 3 diets in that they all represented a relatively unchanging Aboriginal evaluation of the worth of several major kinds of food despite the radically changing availability of these foods. Such traditional evaluations in the context of Western rather than wild foods resulted, for example, in a dramatic increase in the proportion of dietary energy from fat and lower intakes of some vitamins (10). Dietary changes were accompanied by altered patterns of disease, including well-documented increases in hypertension, diabetes, and heart disease (10). Similar observations were made of the Maori—“in spite of increasing use of Westernized foods the Maori will favor fatty foods and traditional seafoods if available” (11).

Such examples suggest that certain contemporary behaviors of humans with respect to foods may relate, at least in part, to non-immediate dietary circumstances. Obesity and its associated health problems and some other current diet-associated conditions (eg, lactose intolerance and celiac disease) seem inextricably bound up in past interactions between humans and their foods. Comparative study of only contemporary Western populations would not provide the temporal depth needed to understand the full etiology of these conditions. Also, for humans, food often is not consumed for its nutritional content but for its relation to the social context and cultural meanings that different
Use of compartmental analysis as a gold standard to compare against other methods for assessing fractional zinc absorption

Dear Sir:

In the article by Lowe et al (1), several experimental methods for assessing fractional zinc absorption (FZA) were compared in 6 women. A rigorous evaluation of the validity of the different experimental techniques is long overdue and we congratulate the authors for their attempt to clarify the issues concerning the various methods being used in different laboratories. The performance of each method was analyzed in relation to the results of a compartmental model, developed and reported on previously (2), that used the same experimental data. Although we read Lowe et al’s article with interest, several issues need clarification.

The incorporation of 3 types of data (fecal, urinary, and plasma) was used as the justification for choosing the compartmental model as the gold standard to compare against other methods that used only one set of data (fecal, urinary, or plasma). We suggest that both the quantity and the quality of the data used should be the main criteria, but there is no information on quality, other than the fact that a constant fractional SD of 0.1 was used by the CONSAM program (3) when the tracer data sets were fit in the compartmental model. Are we to assume that the fecal, urinary, and plasma data all had the same uncertainty associated with them? This seems unlikely given that the sample preparations were all different and that the quantity of zinc in each sample varied widely. The precision of the parameter estimates from an earlier report by Lowe et al (2) was generally good, reflecting the excellent structure and design of the model. However, in 5 of the 6 subjects, the CV for the parameter associated with urinary excretion was >60%.

On the basis of these results, we estimated that the removal of the urinary data from the model would not weaken it.

A criticism of any model is that it is just that: a model. The modeling process makes gross simplifications of the way the body works and any results from it should be scrutinized for false assumptions, unjustified complexity, and unsubstantiated claims of parameter precision. In Lowe et al’s (1) discussion, there was plenty of excellent, well-argued criticism of the other methods used to calculate FZA but no criticism of the compartmental model against which these other methods were compared. Attention should have been drawn to the shortcomings of using modeling in nutritional studies so that other investigators would not be left with the impression that the results from a compartmental model are beyond contradiction.

Another weakness of Lowe et al’s study (1) was the small number of data sets used. Detailed metabolic studies are often constrained by the resources available, thus limiting the number of subjects studied, the procedures that can be undertaken, or both. Although the results obtained from the different methods reviewed was interesting, the method of comparison used was not appropriate. The FZA calculated from the compartmental model is based on an equation containing 2 of the rate constants, which are simultaneously fitted with the other rate constants to the data set provided. There are uncertainties associated with these parameters that were not stated in Lowe et al’s (1) article, although these uncertainties were addressed in their previous study (2) in which the compartmental model was developed. In their more recent article, Lowe et al (1) used the mean and SD of the FZA calculated from the compartmental model, generated from the 6 subjects, as their reference point. Calculation of the SD of the 6 results could give a misleading picture of how good the estimate of the reference FZA is. For instance, if the uncertainties concerning the rate constants are large for each individual subject’s data, the corresponding uncertainty concerning each calculated FZA will be large. If, however, the difference between each of the 6 calculated FZAs is, by chance, small, the SD of the mean FZA will be small. This is the drawback to having only 6 data sets and it applies equally to other methods used to calculate FZA. The conclusion that “We therefore recommend the DITR technique...” is not appropriate. The FZA calculated from the compartmental model is a different perspective. The FZA calculated from the compartmental model is a different perspective.