The energetic joule revisited

Dear Sir:

More than 2 years ago, in these columns, I criticized the proposal to substitute the joule for the calorie in nutrition—a change that I suggested would provide little or no scientific advantage to nutritionists but would, on the contrary, impose some formidable handicaps in our essential task of consumer education (1). Eckhert (2), in reply, summarized the case in favor of the joule as part of a consistent international system of units (the SI system), while indicating that the calorie could possibly at some future time become a derived unit of the SI system. Most of the comments I received, however, were in full agreement with the viewpoint I had expressed.

Now I should like to raise a warning flag in regard to the increasing use of the term "energy" in referring to the calorie content of foods. Because of news coverage of the current oil shortage, the public is becoming somewhat familiar with the sense in which scientists use this word as applied to the energy content of petroleum and other fuels. However, in reference to himself, the consumer equates energy with vigor and well-being, and it does not seem likely that this meaning as applied to humans will soon fade away.

Use of this word in contacts with the general public to designate the calorie content of foods opens the door, of course, for manufacturers of junk foods to advertise their products as good sources of energy. It will be a sorry day for nutrition education if we begin to see food labeling, possibly mandated by the Food and Drug Administration, to this effect: "Energy content per serving ... so many kilojoules."

Physicians, nutritionists, and dietitians have labored for decades to teach the public that energy, in the human sense, is obtained only by eating a balanced diet and otherwise following the rules of good health, not by eating candy bars. Part of this educational heritage is a general consumer understanding that calories are something that may not necessarily make one energetic, but will surely make one fat if one consumes too many of them. This is a major accomplishment that should not be cavalierly discarded. In consumer education, let's keep on referring to the heat and work potential of foods as calories, a term with rich nutritional connotations, rather than use terms that can be misinterpreted by the nonscientist or that carry no nutritional connotations whatsoever.

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Protein requirement for intrauterine growth retarded infants

Dear Sir:

Low birth weight is a major public health problem in both developed and less developed countries. Yet, it has recently been shown that its characteristics vary with the level of development: the proportions of preterm and term low birth weight infants differ markedly, so that in less developed countries almost 75% of low birth weight are due to intrauterine growth retardation (IUGR) and 25% are preterm births. In developed countries the inverse situation holds true (1).

Public health measures should be aimed at producing changes in the birth weight distribution in a population as well as improving the birth-weight specific mortality rate. Improving nutrition during both the prenatal and postnatal periods has been proposed as one measure to achieve these ends. However, in order for the latter to be successful, the specific nutritional requirements of low birth weight infants should be known. Fomon et al. (2) have already proposed these for small premature babies, and this will satisfy a pressing health need in the developed world. The concrete protein needs for IUGR babies are defined in what follows and, hopefully, will contribute to an understanding of the problem in less developed countries.

Fomon's reference infant approach was followed. A "reference infant" was taken to be a baby with the expected birth weight of a full-term fetus (3). This was done for two reasons: first, it is generally agreed that the light-for-date babies require more calories than preterm infants with the same birth weight (they have fewer fat reserves and depleted reserves of liver glycogen). Such babies will get the extra needed calories only if these are calculated by taking into consideration the expected birth weight of a normal newborn with the same gestational age. Second, it is not realistic to use the normal standards for possible intrauterine growth rates, because IUGR and premature babies with the same weight have different extrauterine growth rates (4). The estimate that 14.2% of the weight gained consists of protein, used in following calculations, was derived from that reference fetus, with a gestational age of 38 to 40 weeks (3).

To estimate the weight gain in IUGR infants, the distance growth curve for these infants up to the 3rd month of life (4) was used. The assumption is that these babies (born singly and "healthy") follow the "normal" growth pattern for this type of newborns. According to this data, the average weight at birth was 2150 g and at the 3rd month of life it reached an average of 4850 g for both sexes.

With these figures, one could estimate the daily weight increment of IUGR infants during the first 3 months of life at 29.67 g. Therefore, if 14.2% of this weight is protein, the daily increment in body weight will contain 4.12 g. of protein. If it is accepted that the inevitable protein losses are 0.95/kg per day for a full-sized newborn (5), an average of 0.75 kg/day for IUGR babies can be assumed. If we further consider that a full-term infant fed with human milk can absorb 83% of the protein contained in that milk (6), then its daily protein requirement will be 6.9 g at birth (if its birth weight is 2150 g) or 3.20 g/ per kilogram of weight. Table 1 summarizes the protein requirements for IUGR infants of different ages up to the 3rd month of life, expressed both as protein grams per kilograms of weight and as gram per 100 kcal. One point that is central to these calculations is the amount of estimated weight gain per day. The value used here (30 g) allows these babies the possibility of benefiting from a period of relative catch-up, yet these infants will remain smaller than their normal counterparts at age three (4). This may be the case among large numbers of infants in less developed countries.

TABLE 1
Protein requirements (g/kg of weight per day and g/kcal per day) for IUGR infants in the first 3 months of life

Age	Protein requirements (g/kg weight/day with 83% absorption (5))	Protein requirements (g/100 kcal[a])
mo		
Birth	3.20	2.52
1	2.53	1.95
2	2.16	1.66
3	1.92	1.47

[a] Infant caloric requirements were computed on the basis of the caloric contents of milk from well-fed mothers (70 kcal/100 ml (7) 650 ml/day of milk production (8)).

Nevertheless, despite the fact that these figures can be used by public health workers now, more research should be done in relation to the nutritional requirements of IUGR. One such topic is whether or not the proportion of protein per weight gained is equal in normal and IUGR babies. This fact was assumed here.

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