BODY COMPOSITION AND GROWTH: WORKSHOP SUMMARY

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The objectives of this workshop were two fold: first, to consider the effects on growth and body composition of feeding human milk or proprietary formulas in both term and premature infants. Secondly, to examine the interrelationships between energy intakes and utilization of the major energy source in milk (i.e., fat) during early developmental stages in infants.

Longitudinal studies (7 to 12 months postnatally) of milk intakes and growth in term breast fed infants were the focus of discussions by Cutberto Garza and Margaret Neville from the U.S.A. In both studies, the carefully quantitated intakes of breast milk averaged 735 to 800 ml/day with about 15% population variance. At a measured energy density of 65 kcal/100 ml, estimated energy intakes of the infants studied averaged well below the current Recommended Dietary Allowances. With respect to growth, both investigators observed that comparison of their data to population growth standards from the National Center for Health Statistics (NCHS) demonstrated a progressive deviation from the 50th percentile of mean weight and length growth especially after the first two to three months of life. In discussing these papers, they and the discussant Kay Dewey from the USA, who has made similar observations with respect to differences in growth patterns of breast and formula fed infants, summarized the questions that must yet be answered: first, since slower growth rates in breast fed infants are not seemingly due to maternally limited milk availability, then what regulates the milk intake of a suckling infant? Secondly, what should be the "gold standard" for estimating energy requirements and normative growth patterns in infants? The future approaches to answer these questions must include careful studies of energy balance in infants which incorporate measurements of basal metabolic rates, energy expenditure for activity and body composition using indirect calorimetry, dual isotope methodology and appropriate analysis of body compartments.

The section on growth and body composition of premature infants was pre-empted by a plenary presentation by Bill Heird of the USA. He demonstrated that at high energy intakes, an increase in energy intake did not provide an
increase in weight gain, while a further increase in protein intake did provide an increase in weight gain. These observations could be compared to earlier work in which higher protein intakes without concomittant increases in energy intake had not produced an increase in the rate of weight gain. The message here, reinforced by the observed correlations between the rate of nitrogen storage and the electrolyte retention, was that no one nutrient can be identified as "rate limiting" for growth, but that all nutrients (and therefore an overall increased nutrient density of feedings) must be presented simultaneously for effective growth to take place. This point was reinforced by Guy Putet from France who showed that at moderate levels of metabolizable energy intake, protein supplements have no effect on weight gain, but rather increase the rate of energy expenditure and reduce the rate of energy storage. The net effect is to cause a marked difference in the composition of weight gain, with a relative reduction of lipid storage and a relative increase in protein storage.

Both Robin Whyte from Canada and Putet in presenting their data referred to the similarity in results of energy balance studies conducted with human milk or "standardized formulas" in low birthweight infants. Both commented on the relatively slow rates of weight gain experienced by infants in studies of this nature, despite a wide range in metabolizable energy intake. However, when the high energy, high protein and high electrolyte containing formulas were introduced for growing low birthweight infants, both groups reported much higher rates of weight gain. Whyte in describing the composition of this weight gain, attributed most of the increase in weight gain to a more rapid accumulation of electrolytes and water. It is impossible to interpret this change further, but it should be borne in mind that the increase in the rate of water accretion may reflect an increase in weight gain in either the intracellular or extracellular compartment. Further analysis of the composition of this gain would only be obtained by conducting the same kind of electrolyte balances described by Heird.

Combining the work described by Heird, Whyte and Putet, the most consistent unifying conclusion is that at lower energy intakes (i.e. when energy is the "limiting nutrient") an increase in energy intake may lead to an increase in weight gain, but this effect is restricted when protein intake becomes limiting. The addition of more protein to a high energy intake results in a further increase in the rate of weight gain, and the rates of weight gain enjoyed by infants on the nutrient dense formulas prepared for low birthweight infants is a reflection of the rapid simultaneous gain of all compartments of the body.

Whyte's presentation included a reference to the role of medium chain triglyceride as a partial replacement for fat in high energy formulas. In a randomized controlled clinical trial replacing half the fat of such a formula produced no increase in energy digestibility, expenditure or storage. This was consistent with findings reported by Bitman from the USA who conducted detailed studies of