

Abstracts of Current Literature



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INFANT NUTRITION AND MILK

The relative merits of breast feeding and the use of commercial products patterned after human milk in composition as against simple formulas prepared from cow's milk is ever the subject of debate and investigation. It is generally agreed that infants weaned early from the breast to a cow's milk formula weigh more at one year; better skeleton development and more ossification centers have been demonstrated. A slightly better over-all utilization of nitrogen from the protein of cow's milk than from human milk in rat feeding has been reported; although the biologic value of the latter was slightly higher. With malnourished infants, nitrogen absorptions from the two milks were the same. Nitrogen retentions were not significantly different during the first twenty days; thereafter, there was a slight difference in favor of human milk protein. Differences in weight gains and phosphorus retained were insignificant. Whether there are important differences between human and cow's milk with respect to essential fatty acids, "bifidus factor" or other trace constituents requires further clinical investigation with adequate controls. Heated milks, such as evaporated milk, have lost much of their allergenicity; vitamin B₆ losses are insignificant.

Infant Feeding: Comparison of Breast and Artificial Feeding. F. C. Aitken and F. E. Hytten. *Nutrition Abst. & Rev.*, 104:341, 1960.

The authors criticize much of the published data in which comparisons have been made between breast-fed infants and those fed cow's milk formulas. For instance, it is unsound to take as the formula-fed group those babies who did not do well at the breast. Other variants often uncontrolled that would lead to unwarranted conclusions are differences in birth weight and

birth-weight loss, parental size, social class, time of introduction of solid foods, season of birth or duration of the experiment.

Generally, infants weaned earlier from the breast as compared with those weaned later gain more weight in the first year. With respect to infections of the respiratory tract and gastrointestinal disturbances, the authors find "a great many, often tendentious, papers but few scientific investigations." Infant feeding studies reported more than thirty years ago, when generally poor hygiene was associated with formula feeding, should be disregarded; the more recent studies have had the advantage of better management based on more complete knowledge of the baby's digestive and metabolic capabilities.

The protein intake from feeding human milk is lower than from the usual cow's milk formula. The level is suboptimal for premature babies and for normal babies beyond three months. The authors believe the evidence is not clear that there is a "bifidus factor" in human milk which significantly protects against gastrointestinal infections. The proprietary formula preparations, in which adjustments are made with respect to fat and other constituents so as to imitate human milk, are not justified by any clear evidence.

Cited are 347 published reports. The authors conclude: "This review shows that with modern standards of hygiene, artificial feeding on simple mixtures of cow's milk, water and sugar is a satisfactory substitute for breast feeding, as far as can be judged from growth and health in infancy. There is naturally no suggestion that breast feeding well done is inferior to artificial feeding, but evidence from average energy intake and weight gain suggests that less than the best is perhaps being accepted as satisfactory breast feeding."

FRANK E. RICE

Patterns of Breast Feeding in a Family Health Clinic. E. J. Salber, P. G. Stritt and J. G. Babbott. *New England J. Med.*, 260:310, 1959.

A study was made on the duration of breast feeding of 111 newborn babies of mothers attending a family health clinic and reasons given by mothers for weaning their babies when they did. Forty-three babies were never breast fed; the remaining sixty-eight babies were breast fed for a median period of only 2.9 months. College educated women and wives of men in the upper social class were more inclined to breast feed their babies and for a longer period of time than women who did not go to college.

The most common reasons given for not attempting breast feeding were emotional in nature, i.e., disgust toward the act or excessive modesty. Most of the babies were weaned because of breast abnormality, milk insufficiency or unwillingness of mothers to continue nursing. Possible reasons for the low rate of breast feeding found in the United States as compared to other countries are discussed. M. W. BATES

Balance Studies in Malnourished Jamaican Infants. I. Absorption and Retention of Nitrogen and Phosphorus. J. C. Waterlow and V. G. Wills. *Brit. J. Nutrition*, 14: 183, 1960.

Balance studies were conducted on thirty-seven severely malnourished babies, five of whom died. The purpose of the project was to determine in such cases whether there is an impairment of ability to retain nitrogen, whether such impairment may be the cause of death, and whether there is a depletion of phosphorus as well as protein and potassium.

It was expected that data obtained in the study with protein-depleted babies would throw some light on the question of protein requirement in normal babies. When cow's milk mixtures were fed at the rate 0.3 to 0.4 gm. nitrogen/kg./day, 90 per cent of ingested nitrogen was absorbed (after correction for fecal metabolic nitrogen). At this nitrogen intake, in the early days of the feeding experiment, weight gains were inconsistent: some of the babies lost weight. It was from twenty-six days on that consistent weight gains were achieved.

The authors observe, from their own studies and reports from other clinics on protein-depleted babies, that higher levels of nitrogen intake result in greater absolute amounts of nitrogen retained and higher rates of weight gains. About two-thirds of the phosphorus ingested was absorbed. More phosphorus was retained in relation to nitrogen than would be expected from the ratio of these elements in normal muscle tissue, indicating that some of the extra phosphorus retained may have been taken up by bone.

In the five babies who died, absorption of both nitrogen and phosphorus was satisfactory, all being in positive balance at the time of death. The authors concluded that there is no impairment of ability to retain nitrogen or phosphorus in protein malnourished babies; they believe that their experiments indicated

that 0.3 to 0.4 gm. nitrogen/kg./day is sufficient for the treatment of malnutrition, and that therefore the normal infant requirement need be no greater.

FRANK E. RICE

Balance Studies in Malnourished Jamaican Infants. II. Comparison of Absorption and Retention of Nitrogen and Phosphorus from Human Milk and a Cow's Milk Mixture. J. C. Waterlow, V. G. Wills and P. György. *Brit. J. Nutrition*, 14: 199, 1960.

Observations in other clinics with normal full term infants and with premature babies have shown no significant difference in nitrogen absorption and retention between breast milk and cow's milk mixtures. This study was undertaken to determine whether or not malnourished babies with their great avidity for protein would behave any differently.

The human milk used was pooled and frozen. The cow's milk mixtures were adjusted to imitate human milk in composition using dry skim milk, vegetable oil and carbohydrate, either lactose or dextrimaltose. Feedings were administered so that nitrogen intakes should be as nearly equal as possible. Most intakes were between 0.25 and 0.50 gm. nitrogen/kg. body weight/day.

As treatment progressed, it was found that nitrogen absorption improved with both types of milk; but nitrogen retention tended to fall off, which the authors say "introduces a difficulty in analyzing experiments of this kind." It was concluded, however, that nitrogen absorption was no different in the two types of milk.

With respect to nitrogen retention, during the first twenty days following hospitalization there was no significant difference; during the second twenty days there was a slight difference. In infants receiving human milk 49 per cent of the ingested nitrogen was retained, compared with 41 per cent in infants receiving cow's milk mixtures. This difference, the authors state, may be significant only for infants living on marginal diets.

Weight gain differences in the early days of the experiment were difficult to interpret, because the gains in tissue were masked by loss of water. But from twenty days, the differences between the two milks were definitely insignificant.

Absolute amounts of phosphorus retained from the two feeding regimens were about equal, although the phosphorus content of the human milk was less than half that in the cow's milk mixtures. FRANK E. RICE

Milk fats appear to be uniquely adapted to the needs of the young mammal. The fatty acid spectrums differ from other fats; associated with milk fats are lipids, such as lecithin which has been demonstrated to assist in the digestion and utilization of fat. Coconut oil, a substitute for milk fat used in tropical countries, differs from other fats of plant origin, being extremely high in saturated fatty acids, and negligible in essential fatty acids. It is peculiarly high in lauric acid, compounds of which have



been found to be toxic under some conditions. In feeding experiments with young calves, whole milk gave better results than when milk fat was replaced by other fats. Substitutions with corn oil caused diarrhea and growth depression.

Nutritive Value of Milk and Milk Products. W. A. McGillivray and J. W. G. Porter. *J. Dairy Res.*, 27: 309, 1960.

This is a review of the literature, mainly of the last two years, on the nutritive value of milk and its products as it relates to human nutrition, citing 289 references. The reaction of the human infant to the ingestion of cow's milk formulas continues to be the subject of much investigation. These authors conclude from the evidence, "it is now very clearly established that cow's milk, intelligently modified, is for all practical purposes in no way inferior to human milk for infant feeding." A number of studies are cited showing that infants weaned early from breast milk to a cow's milk formula exhibit better skeletal development and more ossification centers than when breast feeding is prolonged. Research continues, however, on various phases of the subject, e.g., the possible benefit from "bifidus factor" in human milk. The lesser content of essential fatty acids in cow's milk fat as compared with human milk is considered by some researchers to be important, by others not.

Particular attention has been given to vitamin B₆ content in milk products used in infant feeding because of the discovery a few years ago that a pyridoxine deficiency could precipitate convulsive seizures in infants, a condition originally observed on feeding a special manufactured product that had been exposed to excessive heat of sterilization. Commercial processing of milk, however, as in the manufacture of evaporated milk or dry milk has been found not to reduce vitamin B₆ potency to hazardous levels.

Recent studies indicate that true cow's milk allergy in infants is in the order of 1 per cent or less. As milk allergy is generally associated with the lactalbumin, the application of heat, as in sterilization, often overcomes the difficulty.

That milk protein satisfactorily balances the amino acid deficiencies of cereal protein, and that the further addition of lysine and threonine does not improve the biologic values of such intermixtures has lately been demonstrated.

FRANK E. RICE

The Fatty Acids and Glycerides of Cow's Milk Fat. E. L. Jack. *J. Agr. Food Chem.*, 8:377, 1960.

Intimate knowledge of milk fats is of major importance because of their use as food for the newborn animal. In feeding the young, the fats of animal milks are better utilized than mixtures in which milk fat is substituted by plant fats and oils, or by animal tissue depot fats.

Nine saturated and seven unsaturated fatty acids are of quantitative importance in milk fats, whereas other

animal food fats contain predominantly but three saturated and two unsaturated fatty acids. Milk fats are characterized by containing important amounts of the short chain acids, C₄ to C₁₀, especially in the milks of ruminants. With the newer technics, chemists have isolated from milk fat a number of unexpected fatty acids, branched chain, high molecular weight, fatty acids with odd numbered carbon atoms and with double bonds in other than the usual positions.

The distribution pattern of fatty acids in the glyceride molecule is believed to have dietary significance. The authors conclude from their analyses that the theory of random distribution does not hold, but that "there is some specificity in the structure of milk fat glycerides." For instance there is indication that the unsaturated fatty acids may be generally in the external or alpha position in the glyceride moiety, and the saturated fatty acid at the internal or beta position. With investigative tools now becoming available for determining the distribution and location in the glycerides of the individual fatty acids, the significance of these factors in fat utilization will become clearer.

FRANK E. RICE

Nutritional Evaluation of the Replacement of the Fat in Whole Cow's Milk by Coconut Oil. F. E. Rice. *J. Agr. Food Chem.*, 8:488, 1960.

Coconut oil, the cheapest fat in many tropical countries, is mixed with skim milk and offered as a substitute for whole milk for all uses including that of infant feeding. In chemical composition coconut oil is highest of all fats in saturated fatty acids and lowest in essential fatty acids. Lauric acid makes up more than half of the fatty acid content. Compared with milk fat, coconut oil has lower growth promoting value for the young. The literature reveals a number of feeding experiments with lauric acid and its esters wherein toxic effects have been noted, particularly when fed under certain conditions. Milk fat contains a substantial amount of lecithin and other phospholipids which contribute significantly to its nutritional value. It contains less cholesterol than the fat of human milk.

AUTHOR

Investigation of blood glucose levels in the newborn reveal extremely low values as a common finding. Even when the maternal blood is hyperglycemic, infant blood levels decline rapidly within a few hours postpartum. The mechanism of this response requires extensive study.

Blood-Sugar in Infants after Lactose Feeds. J. C. Haworth and J. D. Ford. *Lancet*, 2: 794, 1960.

Twelve babies aged from one day to four months were studied. Three were normal and full term, five were premature and the other four had various pathologic conditions. The total blood sugar and blood glucose levels were measured after the ingestion of lactose-containing feeds. The total sugar level was almost always considerably above the blood glucose level; the difference being 20 to 30 mg./100 ml. and paper chromatography showed this not to be galactose.

It is not easy to see what the discrepancy amounts to in these cases because the methods apparently have a considerable error. No suggestion is made as to what this unknown "saccharoid" might be. A remarkable finding was the astonishing ability of young babies to survive very low blood sugars apparently without symptoms. Two babies had a fasting blood sugar of zero.

F. E. HYTEN

The renal mechanisms for water and electrolyte homeostasis in the normal infant have been regarded as inadequately developed to withstand periods of severe stress associated with deprivation or overload. However, the influence of feeding schedules in infants may significantly influence renal function with respect to the concentration of urine.

Renal Concentrating Mechanisms in Newborn Infants. Effect of Dietary Protein and Water Content, Role of Urea, and Responsiveness to Antidiuretic Hormone. C. M. Edelmann, Jr., H. L. Barnett and V. Troupkou. *J. Clin. Invest.*, 39: 1062, 1960.

Studies were made on renal function of young full term and prematurely born infants. The failure of the young infant to consistently produce urine as hypertonic to plasma as that seen in the adult is explained best through differences in diet and protein metabolism rather than tubular permeability to water in response to ADH. The young infant normally receives a diet high in protein. By virtue of his anabolic state, as well as the form utilized for urinary nitrogen, little urea is available for excretion. A high protein intake or supplementation with urea provides a significantly increased amount of urea for excretion. This results during water restriction in a highly increased urine osmolality and urinary concentration of urea.

The feeding schedule of the young infant, with nourishment given every three to four hours and allowing neither fasting nor thirsting for periods of more than six to eight hours during infancy, contrasts with that of the feeding schedule of the adult. Furthermore, the daily intake of fluid and the rate of turnover of body water is large in the infant compared to the adult. These results tend to show that the findings in infancy are related more to the dietary program than to any intrinsic renal mechanism which may be characteristic for the age.

S. O. WAIFE

Total Body Water in Malnourished Infants. R. Smith. *Clin. Sc.*, 19: 275, 1960.

A characteristic of many infants dying of malnutrition is gross disturbance of fluid and electrolyte balance. In this study twenty-four infants with severe chronic

malnutrition, less than two years of age, had body water measurements made using tritiated water.

Body water averaged 84.5 per cent of body weight in the initial edematous stage of the disease. This was due to not only a real increase in water but also to a remarkable decrease in total body solids, which in eleven children were below 30 per cent of the "ideal" calculated from normal children.

After edema had disappeared the proportion of body water was still high, average 73.1 per cent, but with more complete recovery it fell to 62.6 per cent with a very considerable increase in body solids, averaging 27 gm. daily. This rate of solid gain is astonishingly high compared to the rate for a normal infant growing normally, quoted as 6 gm./day.

F. E. HYTEN

The hereditary disease, acanthocytosis, is characterized by steatorrhea, neurologic defects and hypocholesterolemia associated with a virtual absence of beta lipoproteins. Recent studies suggest that the basic disturbance may be one in which the absorption of linoleic acid is impaired.

On Having no Beta-Lipoprotein. A Syndrome Comprising A-Beta-Lipoproteinaemia, Acanthocytosis and Steatorrhea. H. B. Salt, O. H. Wolff, J. K. Lloyd, A. S. Fosbrooke, A. H. Cameron and D. V. Hubble. *Lancet*, 2: 325, 1960.

Several cases have been reported in the past few years characterized by the celiac syndrome and a condition of the erythrocytes termed acanthocytosis. In two of these there were disturbances of the serum lipids.

In the case described here a female child of healthy unrelated parents began to vomit at five weeks of age and thereafter failed to thrive. At seventeen months of age the child appeared to have an established celiac disease and was admitted to the hospital. The persistent finding of pale clear serum with a total cholesterol level of 19 to 25 mg./100 ml. led to detailed studies of fat absorption. Fat absorption was poor with no chylomicrons appearing after the ingestion of a fat meal. This was not improved by adhering to a gluten-free diet. All serum globulin fractions were depleted, and beta lipoprotein was absent from the blood with correspondingly low levels of cholesterol, phospholipid-total lipid, plasma vitamin A and carotenoids. There was a hypochromic microcytic anemia with 50 per cent acanthocytes. The beta lipoprotein level was reduced to about half its normal level in both parents and in one grandparent. The syndrome, termed by these authors a-beta-lipoproteinemia, is regarded as an inborn error of metabolism with a recessive mode of inheritance.

F. E. HYTEN