EFFECT OF PROTEIN AND TAUrine CONTENT OF MATERNAL DIET ON THE PHYSICAL DEVELOPMENT OF NEONATES

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The effect of taurine and/or protein composition of maternal diets was examined for effects on survival rates and growth of neonates. Most of the effects observed are attributable to the influence of such diets on both the quantity and quality of the milk supplied to the neonates. The taurine and protein content of the diets exhibit an interdependent relationship with respect to regulating the protein and taurine concentration of the milk. The overall effect of dietary taurine was to increase neonatal survival during the period that the mothers received a protein-deficient diet.

INTRODUCTION

In the last few years the possible dietary influence of taurine on brain development has gained increasing attention, notably as a result of the work by Rassin et al. (4, 8), as well as of Hayes and collaborators (3). The present study is an attempt to explore the dietary role of this amino acid on the overall physical development and nervous tissue maturation in mice. This paper only reports on the first aspect of that study.

In certain respects, mice are not the best species to use for such studies since it is now apparent that in these animals a certain amount of taurine is formed endogenously in the liver; in man, monkey, or cat this occurs to a much lesser extent, if at all (7). On the other hand, nutritional studies in mice present far fewer "logistical" problems and, in addition, diets normally supplied to these animals usually do not contain free taurine.

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(see Results). Thus, the addition of taurine to diets of varying protein content may reveal to what extent the growth value of a diet is dependent on an external supply of free taurine. Any effects observed in mice would, by extrapolation, be expected to become even more important for species incapable of synthesizing taurine de novo.

**EXPERIMENTAL PROCEDURE**

One-week pregnancy-timed, randomly bred albino COBS mice (CD-1 strain) were placed on an ad libitum pelleted Purina Rat Chow and water diet until the pups were born. Within 24 hr after birth the litters were equilibrated to 7, 4, or 2 pups per litter (9). At this time the mothers were placed on pelleted diets supplied by ICN Nutritional Biochemicals. These diets (composition available on request or catalog) were identical in the composition of fats, vitamins, and salt mixtures but varied in protein content by adjustment of the casein (protein)/starch ratio. Proven lactating mice with their litters were placed on either a low protein (deficient) diet (8% casein, 78% starch), a normal protein diet (27% casein, 59% starch) or a high protein diet (64% casein, 22% sucrose). In addition, three other groups of nursing mice placed on one of the respective diets also received 0.02% taurine (w/v) in the drinking water. None of the females were restricted otherwise in the amount of food or water available; water supply and bedding were renewed every other day.

Because of the high mortality rate in litters composed of 7 pups with mothers on a protein-deficient diet, a series of studies in that group was also carried out on litter sizes of 4 pups or 2 pups. The positive or negative effects of taurine were always compared between litters composed of identical numbers of pups. Thus, the 4 pups/litter, low-protein group was compared to the 4 pups/litter, low-protein + taurine group; the 7 pups/litter, high-protein group to the 7 pups/litter, high-protein group + taurine, etc. On day 16, when the pups usually begin to eat some solid food, all diets were replaced with the normal protein diet (27/59) and a conventional water supply.

The average weight change of each litter was noted every two days, as well as that of the mother, for a total three-week period after birth of the pups. Results pertain, unless explicitly stated otherwise, to number of litters (in parenthesis, see Results) and not to individual animals. Except for the 2 or 4 pups/litter groups (all female), the 7 pups/litter groups were always composed of 4 females and 3 males. Up to 3 weeks little difference in weight gain for males or females was noted, but thereafter males gained weight at increased rates compared to their female littermates. The results reported only cover the females of the litters, in order to allow direct comparisons between the groups on six different diets. The three males merely served to obtain litters of 7 pups consistently composed of the same sex ratios.

Milk was obtained by separating pups from their mothers for 4 hr and then allowing exactly 30 min for suckling. In the normal protein group that time period appeared sufficient to satisfy the pups since in most instances they voluntarily stopped suckling before 30 min had passed. The pups were killed, just curdled milk was removed from the stomach, frozen, and weighed. Deproteinization and further processing of the milk, or diet, for amino acid analysis was performed as described previously (10); methods for protein (Lowry) and amino acid determinations were routine.