Despite intensive studies by a number of investigators the functions of taurine, and, in particular, the reason for the large amounts found in most mammalian tissues remain unknown. Taurine has been associated with many different biological functions (Jacobsen and Smith, 1968; Huxtable and Barbeau, 1976; Barbeau and Huxtable, 1978) but only its role in conjugating with bile acids is well established. We have concentrated upon possible functions of taurine during development. If taurine is of importance to the brain it is during this vulnerable period that a failure to supply adequate amounts of this compound might have the most long-lasting effects. Thus, the study of the transfer of taurine to the fetus and taurine nutrition in the neonate is of considerable potential importance.

The high concentration of taurine in brain during fetal development of the rat, monkey, rabbit and man at a time when the presumed synthetic pathway, via cysteinesulfinic acid decarboxylase, has little measurable activity implies that a dietary source of taurine is necessary (Sturman et al., 1977b, 1978a; Gaull and Rassin, 1979). In studies designed to investigate the effects on preterm infants of feeding formulas containing different protein quantity and quality and comparing these infants with infants fed pooled human milk, an interesting pattern of plasma and urine amino acid concentrations was observed. The amino acid concentrations in plasma and urine generally were either increased or unchanged when compared with those infants fed pooled human milk (Rassin et al., 1977a,b). The striking
exception was taurine (Gaull et al., 1977). The concentration of taurine in the urine of infants fed casein-predominant formulas was lower from the first week of study than that of infants fed pooled human milk. The plasma taurine decreased steadily and by the fourth week of study was significantly lower in the plasma of infants fed formulas than it was in infants fed the pooled human milk. Preliminary studies in term infants show generally similar results (Rassin et al., 1979). Furthermore, as we measure it, the concentration of taurine in plasma and urine of breast-fed term infants is considerably higher than that of pre-term infants fed pooled human milk at a fixed volume. The reason for this difference is not as yet clear. In effect, however, the differences in plasma and urine taurine concentration between the infants fed formulas and those fed human milk are greater in term infants than they are in preterm infants. The small concentrations of taurine in plasma of infants fed artificial formulas has been documented by others but not commented on (Dickinson et al., 1970).

The finding of a dietary requirement for taurine in the human infant is consistent with the negligible activity of cysteinesulfinic acid decarboxylase present both in fetal and in mature human liver (Gaull et al., 1977).

This evidence for the relative inability of man to synthesize taurine and the pattern of deficiency of taurine in the plasma and urine led us to an examination of the milk of various species, as well as of some currently available commercial formulas. Taurine is a major constituent of the free amino acid pool of milk in a number of species (Rassin et al., 1978). Human milk contains a considerable amount of taurine whereas bovine milk, from which most of the formulas are prepared, contains only minimal amounts of taurine (Gaull et al., 1977). The lack of taurine in the casein-predominant formulas in this study of preterm infant feeding reflected the lack of taurine in the bovine milk from which the formulas were prepared. The three major commercial infant formulas available in the United States contained only small amounts of taurine, and soy-based formulas contained none at all. For most species studied, taurine is a major constituent of the free amino acid pool of milk, and it has a greater concentration early in lactation.

These clinical findings led us to examine the transfer of taurine from the mother to the infant using the rat as a model. The concentration of taurine in rat milk is considerable for the first few days after birth. At this time it is the ninhydrin positive compound present in highest concentration. The concentration of taurine in milk decreases rapidly thereafter, and by a week after birth it has reached an approximate constant value (Sturman et al., 1977a). The total amount of taurine transferred to the pup via the milk decreases initially but increases again by the first week after birth.