Monosodium Glutamate Effects

Adamo and Ratner (*1*) reported failure to detect brain damage in infant rats injected subcutaneously with monosodium glutamate (MSG). While noting that this was contrary to my findings in several species, including the rat, they proposed species variation to explain the discrepancy. Others have found both the rat (*2*) and mouse (*2, 3*) susceptible to MSG-induced brain damage.

In infant retina (*4*) and hypothalamus (*5*), susceptible nerve cells undergo rapid necrosis and are phagocytized, degraded, and evacuated from affected areas within 24 to 48 hours after MSG treatment. Thereafter, except for a reduced population of neurons, the affected areas appear normal when examined by either the light or electron microscope (*5, 6*). Thus, Adamo and Ratner's observation that normal neural components can be found in the adult brain of an animal treated with MSG in infancy does not constitute a valid basis for claiming that MSG lacks effect on infant brain. Adamo and Ratner omitted illustrating infant brain (*1*).

Although Adamo and Ratner considered their experiment "very similar" to mine, they departed from mine by confining their electron microscopic examination to adult brain and preparing infant brain according to a regimen for light microscopy which differs in every feature of tissue processing from the methods I employ (*5, 7, 8*). If I interpret them correctly, they also used an exceedingly hypertonic solution of MSG (40 percent?) rather than the 10 percent concentration I use with rodents (*5, 8, 9*). It is more reasonable to attribute Adamo and Ratner's negative findings to methodological problems than to species variation.

I also question Adamo and Ratner's conclusion that MSG has no effect on reproductive function in the rat. Others (*10, 11*) have systematically examined larger numbers of adult rats after multiple MSG treatments in infancy and have consistently found that average weights of the ovaries and adenohypophyses are about one-half those of control animals. Pituitary concentrations of trophic hormones, including luteinizing hormone, were also depressed (*10*). Since Adamo and Ratner studied very few animals, exposed each to only one injection of MSG, and did not measure the weights or hormone concentrations of adenohypophyses or attempt to compare the reproductive capacities of experimental and control animals, but did find the ovaries of experimental animals significantly smaller than controls, their conclusion that MSG lacks effect on reproductive function is probably a misinterpretation based on insufficient data.

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Our study (*1*) was the first report to suggest the possibility that a single subcutaneous injection of MSG may not produce neuronal necrosis in the arcuate nucleus of infant rats. This is contrary to the findings shown by Olney (*2*) in a 5-day-old Swiss albino mouse and by Olney and Sharpe (*3*) in an infant monkey. Olney reported (*2*) that brain lesions were found also in albino rats after MSG treatment in the neonatal period, but neither pictures nor descriptions of these lesions in rats were given. Light microscopic observation of tissue from treated infant rat brains (*1*) revealed different morphologic features from those shown in the light micrographs by Olney (*2*) and Olney and Sharpe (*3*). At the time of our publication (*1*) their reports (*2, 3*) presented the only published data concerned with the effect of a single subcutaneous injection of MSG on the hypothalamus.

We did not observe any acute changes in the arcuate nucleus by light microscopic examination. Although the tissue was examined carefully, it is possible that we failed to notice very subtle differences between treated and untreated rats; electron microscopy of the brains of infant rats after injection would have revealed this effect with certainty if it were present. Nevertheless, it is difficult to envision that effects such as reported by Olney (*2*) and Olney and Sharpe (*3*) would have escaped our attention, even with light microscopy. Such extensive damage in the infant brain, if present after a single injection, should have been indicated by morphologic differences between brains of adult control and adult experimental rats treated in infancy.

In presenting our data (*1*) we neither implied nor negated the possibility that repeated doses of MSG might produce results different from ours. The abstract (*4*) referred to by Olney in his technical comment (this issue) reveals that, in rats repeated injections of MSG in increasing doses over a 10-day period results in marked inhibition of endocrine function. A comparison of the findings in this study (*4*) to the lack of effect noted by us in animals which received a single injection of MSG is not appropriate.

Since much of the discussion in Olney's comment alludes to unpublished data (*5*) unknown to us or to the scientific community in general, one must await the published reports and evaluate them accordingly.

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