

The Effects of Chronic Administration of Food Colorings on Activity Levels and Cognitive Performance in Normal and Hyperactive Developing Rat Pups

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Since Feingold's initial proposal in 1973, the notion that ingestion of artificial flavors and colorings may predispose to minimal brain dysfunction (MBD) in children has gained widespread acceptance with the general public. Although Feingold produced little objective evidence to support his hypothesis, recent clinical investigations suggest a relationship between MBD and the consumption of the so-called food additives. However, such studies in children are by necessity limited to relatively short-term evaluations.

In order to circumvent this difficulty, we have investigated the effects of administration of food colorings on developing rat pups treated with 6-hydroxydopamine (6-OHDA) at 5 days of age. Such treatment results in a syndrome that is strikingly similar to the clinical disorder of MBD in children, with hyperactivity that abates with maturity and persistent marked deficits in avoidance learning. We investigated four groups of rat pups: (1) 6-OHDA-treated pups receiving food colorings (a mixture of those contained in the average American diet at doses of 0.5, 1.0 and 2.0 mg per kilogram of body weight); (2) 6-OHDA-treated pups receiving water; (3) normal rat pups receiving food colorings; and (4) normal pups receiving water. As we have shown previously, brain dopamine concentrations in 6-OHDA-treated pups were reduced to less than 50% of control levels while norepinephrine was unaffected. Activity levels in 6-OHDA-treated animals were significantly greater than in controls, and at the high dose (2.0 mg per kilogram) of food colorings this activity was increased still further. Activity levels in normal rat pups treated with high doses of food colorings were elevated as well. Performance in the T-maze and shuttle box was impaired in 6-OHDA-treated animals but was not further affected by food colorings. However, escape latency in the normal animals fed the food coloring mixture demonstrated markedly impaired performance in both the T-maze at 20 days of age and the shuttle box at 27 days.

Our results suggest that the administration of food colorings may affect normal development, and they mandate a more critical evaluation of the effects of food colorings in both animals and children. Our results also suggest that hyperactivity should not be the sole factor investigated, and that measures of the effects of food coloring on cognitive function must be carefully evaluated in any future study.

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