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It is a common misconception; when children become hyperactive after eating a piece of cake or some candy, parents often think the sugar is to blame. What many parents do not know is the artificial food coloring is more likely to be causing the hyperactivity. According to Fulmer (2008), "new research suggests that the rainbow of artificial colors may have a bigger effect on children's behavior" (p. 1). This research adds to the mounting evidence linking artificial food coloring and other additives to Attention Deficit/Hyperactivity Disorder (ADHD), hyperactivity, and other behavioral problems.

I discovered the link between food coloring and hyperactivity about eight years ago. My oldest daughter was four years old at the time and she was starting to show signs of Attention Deficit/Hyperactivity Disorder (ADHD). It seemed like there was nothing anyone could do to control her. I did not want to resort to medication at such a young age, but I knew I had to do something. I was desperate. Then I learned that artificial food coloring has been linked to ADHD, hyperactivity, and other behavior problems. I was amazed at my daughter's transformation once food coloring had been eliminated from her diet. She was much calmer and better behaved; she even slept better. Since then, I have discovered that food coloring has similar effects on me. It makes me extremely irritable and causes insomnia. My daughter and I have both found that the effects are so noticeable that we can tell if a food contains artificial food coloring within fifteen minutes of eating it, without looking at the ingredients.

The connection between food additives and behavioral problems was first suggested in the 1970s by allergist, Dr. Feingold (Kavale & Forness, 1983). To alleviate symptoms of ADHD and other behavior disorders, Feingold recommended a diet free of artificial flavors, synthetic dyes, and salicylates. This diet appeared to reduce hyperactivity in children and prompted further scientific research. Since its creation, the Feingold Diet has been heavily debated by scientists, physicians, and parents alike. According to behavioral toxicologist, Bernard Weiss, "the total evidence, although not wholly consistent, nevertheless suggests that [the Feingold] hypothesis is, in principle, correct" (Center for Science in the Public Interest, 2008, p. 3).

In spite of the potential effects on children, food manufacturers seem to be using more artificial food coloring than ever. The average consumption of food coloring, per capita, has

increased from 12 mg in 1955 to 59 mg in 2007 (Fulmer, 2008). Cereals, cookies, and other foods are now offered in a large array of colors. Food coloring can even be found in the most unexpected places. Yellow-5 and yellow-6 can be found in several brands of frozen waffles, cake mix, macaroni and cheese, and microwave popcorn, while most marshmallows contain blue-1. Even some brands of pepperoni and beef bouillon contain the food coloring red-40. CSPI (2008) credits this increased exposure to food coloring for the increase in ADHD and other behavioral problems.

Yellow-5 is one of the most commonly used food colorings in the United States and it has some of the worst side effects, such as irritability, restlessness, and sleep disturbances. In 1986, the FDA concluded that yellow-5 causes itching and hives in a small group of people (Fulmer, 2008). It is also the only color to be tested alone in studies. In one such study, CSPI (2008) reported 83% of the subjects suspected of having food coloring sensitivities reacted to this dye. Meanwhile, reactions were recorded in 10% of the subjects with no reported attention deficit or hyperactivity and no suspected sensitivity to food coloring. Increased exposure to this particular color intensifies side effects and prolongs their duration.

Food coloring does serve a purpose. According to the FDA website (2004), food coloring is used to "Offset color loss due to exposure to light, air, temperature extremes, moisture and storage conditions; correct natural variations in color; enhance colors that occur naturally; provide color to colorless and 'fun' foods". However, food manufacturers can achieve similar results by using natural dyes derived from plants, animals, or minerals. Unfortunately, most manufacturers are unwilling to use natural dyes because they are more expensive. As Fulmer (2008) explained, natural colors are not as concentrated as the synthetic versions; therefore, more dye must be used in order to achieve the same effects. The question is what is more important, the bottom line or the health and wellbeing of our children?

In 2004, Schab and Trinh reviewed 427 studies on the effects of food coloring on behavior. Twenty-one of these studies were double-blind and placebo-controlled. Based on their review, Schab and Trinh concluded "the effect of dyes on children was statistically significant, particularly with regard to parents' ratings" and "that dyes 'promote hyperactivity in hyperactive children, as measured on behavioral rating scales'" (CSPI, 2008, p.6).

Additional studies were conducted by C. K. Conners, a researcher on the effects of food additives on behavior. In one study, Conners observed sixteen hyperactive children between the ages of four and eleven. When the children were placed on a dye-free diet, teachers reported a 34% reduction in problem behavior and parent reported a 57% reduction. Then, in a double-blind challenge, some children were given a cookie containing 26 mg of food coloring, while others were given a placebo cookie containing no food coloring. Three of the children between the ages of six and seven showed severe a decline in their performance after eating the cookie containing food coloring. In another similar study, Conners found 31% of the children tested had noticeable reactions to food coloring (CSPI, 2008).

Most recently, the British Food Standards Agency (FSA) funded two studies on the effects of synthetic dyes and the preservative sodium benzoate on hyperactivity. The University of Southampton conducted both of these double blind, placebo-controlled studies. Unlike many other studies, which only examined hyperactive children, these examined a cross-section of children from the general population. The first study, conducted in 2004, observed the effects of sunset yellow (yellow-6), carmoisine, tartrazine (yellow-5), ponceau 4R and the preservative sodium benzoate on three year olds. In 2007, a second study expanded on the first by including eight and nine year old children, as well as a second mixture of sunset yellow, carmoisine, quinolone yellow, allura red AC, and sodium benzoate. Both studies concluded that artificial food coloring consistently caused a significant deterioration in the children's behavior. The 2007 study concluded "artificial colours or sodium benzoate (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children in the general population" (McCann, et al, 2007, abstract).

Admittedly, some of the studies show that food coloring only affects a small percentage of children. However, many of these studies are outdated compared to today's more refined and accurate research methods. The amount of food coloring used in the studies can also affect their outcomes. According to CSPI (2008), "some of the studies that have been conducted used doses of dyes lower than what the average child is likely to consume" (p. 8). The studies done by the University of Southampton are a prime example of this. Both studies only used 20 mg of artificial food coloring, much less than the average person consumes per day. Meanwhile, studies that used higher doses of food coloring revealed a higher percentage of children were affected.

For example, in one of the few studies using as much as 100 mg to 150 mg of food coloring, 17 out of 20 children showed signs of increase hyperactivity and inattention (CSPI, 2008).

Nevertheless, the FSA has taken action based on the University of Southampton studies and other research by issuing a statement to parents advising them of the link between artificial food coloring and hyperactivity. In addition, the FSA has asked food manufacturers to eliminate six synthetic dyes from their products voluntarily. Any manufacturers that continue to use artificial food coloring will be required to add a warning label to these products. In response to the FSA's requests, many companies have now eliminated most synthetic colors from products sold in England. Unfortunately, these same companies continue to use these dyes in products sold in the United States. For example, Mars continues to use artificial food coloring in all Skittles, Starburst, and M&Ms sold in the United States, while their European versions use natural colors (CSPI, 2008).

Similar actions have been taken all across Europe. For example, in 2004, Wales required the elimination of food coloring from all school lunches. Following a vote in 2008, the European Union's Environment Committee has initiated a ban on food coloring in all foods geared towards infants and small children (Fulmer, 2008). Additionally, the "European consumer rights group BEUC (Brussels) and 41 public interest groups from across the European Union (EU) are calling on the European Commission to ban six food colorants on the grounds that the substances cause hyperactivity in some children (Scott & Phillips, 2008, p. 30).

The Center for Science in the Public Interest (CSPI), a non-profit organization, is trying to get similar laws passed in the United States. In 2008, they submitted a petition urging the FDA to ban artificial food coloring. In the interim, the petition calls for warning labels on all food containing synthetic colors. CSPI has also requested funding for additional research on the effects of food additives on behavior. Other U.S. researchers and physicians have called for the elimination of artificial food coloring as well, arguing that it "clearly [has] a significant adverse effect on some children" (CSPI, 2008, p. 13).

Despite the mounting evidence linking artificial food coloring to hyperactivity, the FDA continues to deny any correlation. According to the FDA website (2004), "the Consensus Development Panel of the National Institutes of Health concluded in 1982 that there was no scientific evidence to support the claim that additives or colorings cause hyperactivity."

However, this information is outdated and misleading. At the NIH Consensus Development Conference, Dr. Arnold (1998) pointed out that since 1982 at least seven controlled studies revealed that elimination diets produced significant improvements in behavior.

CSPI (2008) estimates between 3% and 10% of children in the United States suffer from Attention Deficit/Hyperactivity Disorder (ADHD) or other behavioral problems. Many of these children could avoid or reduce the use of stimulant medications by simply eliminating artificial food coloring from their diet. Yet, so many parents are unaware of food coloring's effects. It is time to spread the word. Artificial food coloring can cause hyperactivity.

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