

Neurobehavioral Effects of Artificial Food Dyes, with Bernard Weiss

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In the past several decades there has been a sharp increase in the amount of artificial dyes and flavorings children encounter daily in foods, beverages, medicines, and toiletries such as toothpaste. Over the same period there has been a marked increase in the number of diagnoses of neurobehavioral disorders such as attention deficit/hyperactivity disorder. Bernard Weiss began studying potential links between artificial food dyes and neurobehavioral effects in children in the late 1970s. In this podcast he discusses some of his earliest research and tells why he remains convinced the two are connected. Weiss is a professor in the Department of Environmental Medicine at the University of Rochester Medical Center.

AHEARN: It's *The Researcher's Perspective*. I'm Ashley Ahearn.

For many kids, Saturday morning isn't complete without cartoons and brightly colored breakfast cereals.

But many of the additives used to make cereals in bright reds, greens, yellows, and blues have been shown to cause cancer in animals¹ and are strongly suspected of causing neurologic problems such as attention deficit/hyperactivity disorder [ADHD] in children.²

Since the late '70s Dr. Bernie Weiss has studied the neurotoxic effects of artificial food dyes. He's a professor in the Department of Environmental Medicine at the University of Rochester Medical Center.

But before Dr. Weiss signed on to conduct research in this area, he needed to see the behavioral effects firsthand. So he visited a medical center in Santa Clara, California, where one of his colleagues, Dr. Ben Feingold,³ said there were children with behavioral problems that he suspected were linked to their exposure to food additives.

Dr. Weiss, why don't you start by telling me what you saw in Santa Clara that convinced

you that this research was necessary?

WEISS: We spoke to the pediatricians. They told us stories. Dr. Hicks-Williams, who was chief, told me the following story. He had a colicky baby whose parents were going crazy. They had no way of changing the child's behavior. They tried every intervention they could think of. Finally he asked, "Do you give the baby vitamin drops?" "Yes." "Are they colored?" "Yes." "Why don't you stop?" They stopped, and the colic disappeared.

Another pediatrician told us this story: A child in his office was running wild. He asked the mother, "Is he always like this?" "No," she said, "only when he has Tic Tacs." I thought it was worthwhile at the time to conduct a real controlled trial of the impact of food colors on behavior, so we prepared what we call a single-subject experiment. We would administer a blend of food dyes on occasional days to children to see whether or not we could evoke the same kind of response time after time. On other days they would get another liquid masked to look like a blend of food colors [but] devoid of food colors. The behaviors we chose were in fact chosen by the parents. We gave them a long list, on cards, of behaviors from various behavioral inventories, told them to select 10 characteristic of their children when they misbehaved, and then, over the course of the next 11 weeks, we recorded their responses every day, and at the end of the study we did the analysis.

In that group we found two responders, one who was really a spectacular 34-month-old girl who, every day that she received the food colors, responded with a lot of wild behavior. That study was written up, published in *Science* in 1980,⁴ in the same issue as another study by Kinsbourne and Swanson,⁵ who had studied hyperactive boys—who administered them a blend of food colors several times larger than ours and studied the effects on learned behavior; that is, how well they learned. They also found a very significant effect.

There has been study after study, all pointing in the same direction: that is, in some children at least, food additives—and in particular food dyes, because they've been the

most studied—have the ability to evoke behaviors that we would call hyperactivity.

AHEARN: Do you think the rise in ADHD diagnoses since the '70s might be related to the increased number of artificially colored foods and drinks that kids are consuming?

WEISS: To me the evidence implicating food colors as a provocative chemical is clear. [But] you have to remember that these kids are exposed to thousands of chemicals in the environment. We know that some of them, such as lead, are very powerful members of the class of chemicals we call neurotoxicants; that is, they are toxic to the nervous system, to the brain. Endocrine disruptors such as those that are found in plastics also have the ability to change behaviors of this kind. Pesticides are also found in most children's bodies today, and they too have the ability to provoke these kinds of behaviors. Our children are really facing an assault of chemicals, many of which have the ability to change how the brain functions.

AHEARN: What is it about these additives that could be leading them to have these effects on children?

WEISS: That's a very good question, and I don't have the answer because we really don't know the fundamental pharmacological and biochemical mechanism by which they evoke these behaviors.

AHEARN: Let's talk a little bit about regulation. Food colors are still not required to undergo testing for neurobehavioral toxicity in the United States. But, as I understand it, these substances are more strictly regulated in Europe.⁶

WEISS: Everything seems to be more strictly regulated in Europe [laughs], I'm afraid. The counterpart of the Food and Drug Administration [FDA] in the UK now advises parents to stay away, if they can, from food colors. I suspect that in the future they will regulate them much more stringently. In the United States the Food and Drug Administration still insists that food colors present no health risks. I've been at war with

the FDA for about 30 years over this question.

AHEARN: And what do you think needs to happen now?

WEISS: I think the FDA first has to support research on the neurotoxicity of these additives, and especially food colors, for which we have the best evidence. Second, I think it's incumbent on the FDA to require the suppliers and manufacturers of these chemicals to conduct the research themselves.

AHEARN: Do you have kids?

WEISS: Oh yes, I even have grandkids.

AHEARN: And do they eat pink or green cereal?

WEISS: No [laughs]!

AHEARN: Not when they're visiting Grandpa anyway.

WEISS: No [laughs]!

AHEARN: Well, Dr. Weiss, thank you so much for joining me.

WEISS: Thank you.

AHEARN: Dr. Bernie Weiss is a professor in the Department of Environmental Medicine at the University of Rochester Medical Center.

And that's *The Researcher's Perspective*. I'm Ashley Ahearn. Thanks for downloading!

References and Notes

1 CSPI. Food Dyes: A Rainbow of Risks. Washington, DC:Center for Science in the Public Interest (2010). Available: <http://tinyurl.com/2dsxlvd> [accessed 24 Sep 2010].

2 Schab DW, Trinh NH. *J Dev Behav Pediatr* 25(6):423–434 (2004).

3 Starting in the 1960s Benjamin Feingold developed a food elimination strategy known as the Feingold Program that has been used to treat ADHD, among other conditions. People following the two-stage program eliminate synthetic colors, flavors, preservatives, and sweeteners from their diet. They also eliminate foods rich in salicylates, including certain fruits, vegetables, nuts, and spices, as well as aspirin.

4 Weiss B, et al. *Science* 207(4438):1487–1489 (1980).

5 Swanson JM, Kinsbourne M. *Science* 207(4438):1485–1487 (1980).

6 EFSA. Compulsory warnings on colours in food and drink [press release]. 22 Jul 2010. London:European Food Standards Agency. Available: <http://tinyurl.com/3xbua38> [accessed 29 Sep 2010].

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