Food additives and hyperactive behaviour in 3-year-old and 8/9-year-old children in the community:  
A randomised, double-blinded, placebo-controlled trial  

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FROM ABSTRACT

Background
We undertook a randomised, double-blinded, placebo-controlled, crossover trial to test whether intake of artificial food colour and additives (AFCA) affected childhood behaviour.

Methods
153 3-year-old and 144 8/9-year-old children were included in the study.

The challenge drink contained sodium benzoate and one of two AFCA mixes (A or B) or a placebo mix. The main outcome measure was a global hyperactivity aggregate (GHA), based on aggregated z-scores of observed behaviours and ratings by teachers and parents, plus, for 8/9-year-old children, a computerised test of attention.

Findings
Mix A had a significantly adverse effect compared with placebo in GHA for all 3-year-old children but not mix B versus placebo.

8/9-year-old children showed a significantly adverse effect when given mix A or mix B.

Interpretation
Artificial colours or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children in the general population.

THESE AUTHORS ALSO NOTE:

“Artificial food colours and other food additives (AFCA) have long been suggested to affect behaviour in children.”
The detrimental effect of AFCA on childhood behaviour has been in the scientific literature since Ben Feingold published “Hyperkinesis and learning disabilities linked to artificial food flavors and colours” in the American Journal of Nursing in 1975.

“The main putative effect of AFCA is to produce overactive, impulsive, and inattentive behaviour—i.e., hyperactivity—which is a pattern of behaviour that shows substantial individual differences in the general population. Children who show this behaviour pattern to a large degree are probably diagnosed with attention-deficit hyperactivity disorder (ADHD).”


In this study, the two active mixes differed both in the quantities of additives and the specific additives included. Mix A for 3-year-old children included 20 mg of artificial food colourings (5 mg sunset yellow, 2-5 mg carmoisine, 7-5 mg tartrazine, and 5 mg ponceau 4R and 45 mg of sodium benzoate.

Active mix B included 30 mg of artificial food colourings (7-5 mg sunset yellow, 7-5 mg carmoisine, 7-5 mg quinoline yellow, and 7-5 mg allura red AC and 45 mg of sodium benzoate.

Three measures of behaviour were used to calculate global hyperactivity aggregate (GHA):
1) The abbreviated ADHD rating scale IV.
2) Parent rating their child's behaviour (switching activities; interrupting or talking too much; wriggling; fiddling with objects or own body; restless; always on the go; concentration), by use of the abbreviated Weiss-Werry-Peters (WWP) hyperactivity scale.
3) A third measure was the classroom observation code, which assesses behaviours during structured teaching and during periods of independent work under teacher supervision.

“A high GHA indicates more hyperactivity.”

DISCUSSION

“In this community-based, double-blinded, placebo-controlled food challenge, we tested the effects of artificial food additives on children's behaviour and have shown that a mix of additives commonly found in children's food increases the mean level of hyperactivity in children aged 3 years and 8/9 years.”
“This study provides evidence of deleterious effects of AFCA on children's behaviour with data from a whole population sample, using a combination of robust objective measures with strong ecological validity, based partly on observations in the classroom and ratings of behaviour made independently by teachers and by parents in the different context of the home and applying double-blinded challenges with quantities of additives equal to typical dietary intakes.”

“The present findings, in combination with the replicated evidence for the AFCA effects on the behaviour of 3-year-old children, lend strong support for the case that food additives exacerbate hyperactive behaviours (inattention, impulsivity, and overactivity) in children at least up to middle childhood.”

“Increased hyperactivity is associated with the development of educational difficulties, especially in relation to reading, and therefore these adverse effects could affect the child's ability to benefit from the experience of schooling.”

“These findings show that adverse effects are not just seen in children with extreme hyperactivity (ie, ADHD), but can also be seen in the general population and across the range of severities of hyperactivity. Our results are consistent with those from previous studies and extend the findings to show significant effects in the general population. The effects are shown after a rigorous control of placebo effects and for children with the full range of levels of hyperactivity.”

“We have found an adverse effect of food additives on the hyperactive behaviour of 3-year-old and 8/9-year-old children.”

“The implications of these results for the regulation of food additive use could be substantial.”

HealthDay News

THURSDAY, Sept. 6, 2007

THIS REVIEW, IN PART, NOTES:

“Some common food colorings and preservatives appear to increase the risk of hyperactive behavior among children, British researchers report.”

“The link between food additives and hyperactivity has long been suspected, but this is the first study to show a direct connection”.

In the study, drinks containing artificial food coloring and additives such as sodium benzoate, which are similar to the drinks that are commercially available, were given to 297 children. The amount of additives were similar to what is found in one or two servings of candy per day. As a control, some children were given drinks without additives.
The trial lasted six weeks. Children who drank the drinks containing additives displayed significantly more hyperactive behavior and shorter attention spans.

“One of the additives, sodium benzoate, has been linked to cell damage in a previous study, and to an increase for cancer. Sodium benzoate is found in Coca-Cola, Pepsi Max and Diet Pepsi, and in many fruit drinks.”

“Other additives assessed in the study include a number of colorings -- sunset yellow (E110), found in fruity drinks; carmoisine (E122), a red coloring often added to jams; ponceau 4R (E124), a red food coloring; tartrazine (E102), found in lollipops and carbonated drinks; quinoline yellow (E104), a food coloring; and allura red AC (E129), and orange-red food dye.”

**Time**
*September 24, 2007*

**Hyper Kids? Check Their Diet**

*Research confirms a long-suspected link between hyperactivity and food additives*

By Clauiwa Wallis

**THIS ARTICLE NOTES, IN PART:**

“Parents have long observed that some kids go bonkers after eating foods with a lot of artificial ingredients or neon-bright colors.”

“A carefully designed study published in the British journal the *Lancet* shows that a variety of common food dyes and the preservative sodium benzoate—an ingredient in many soft drinks, fruit juices and salad dressings—do cause some kids to become measurably more hyperactive and distractible.”

“The study is one more reason to cheer the trend toward less processed, more natural fare.”

**KEY POINTS FROM DAN MURPHY**

1) “Artificial colours or a sodium benzoate preservative (or both) in the diet result in increased hyperactivity in 3-year-old and 8/9-year-old children in the general population.”

2) “Artificial food colours and other food additives (AFCA) have long been suggested to affect behaviour in children.”

3) The detrimental effect of AFCA on childhood behaviour has been in the scientific literature since Ben Feingold published “Hyperkinesis and learning
disabilities linked to artificial food flavors and colours” in the American Journal of Nursing in 1975.

4) “The main putative effect of AFCA is to produce overactive, impulsive, and inattentive behaviour—ie, hyperactivity—which is a pattern of behaviour that shows substantial individual differences in the general population. Children who show this behaviour pattern to a large degree are probably diagnosed with attention-deficit hyperactivity disorder (ADHD).”

5) This study provides evidence of deleterious effects of AFCA on children's behaviour at typical dietary intakes.

6) “Increased hyperactivity is associated with the development of educational difficulties, especially in relation to reading, and therefore these adverse effects could affect the child's ability to benefit from the experience of schooling.”

7) “One of the additives, sodium benzoate, has been linked to cell damage in a previous study, and to an increased for cancer. Sodium benzoate is found in Coca-Cola, Pepsi Max and Diet Pepsi, and in many fruit drinks.”

8) “Parents have long observed that some kids go bonkers after eating foods with a lot of artificial ingredients or neon-bright colors.”

9) “A carefully designed study published in the British journal the *Lancet* shows that a variety of common food dyes and the preservative sodium benzoate—an ingredient in many soft drinks, fruit juices and salad dressings—do cause some kids to become measurable more hyperactive and distractible.”

10) “The study is one more reason to cheer the trend toward less processed, more natural fare.”