Pure Facts

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Behavioral Toxicology: the adverse behavioral effects of chemicals

Air pollutants, pesticides, fuels, solvents, and heavy metals are some of the toxic substances in our environment. The damage they cause is clear.

The new science of behavioral toxicology came with the recognition that the harmful effects of environmental chemicals should also be measured by how people feel and function, not only by death and obvious damage.

The Most Vulnerable

"Dose is the key variable in toxicology," Dr. Bernard Weiss noted in his address to the Feingold Conference, "and young organisms will be affected at lower doses than the adult."

The youngest children are often at greatest risk, and the fetus can suffer severe effects from substances to which its mother is exposed. This was tragically confirmed by an episode of methylmercury poisoning which took place in Iraq in the early 1970s.

Methylmercury has long been used as a fungicide, and when the Iraqi government purchased 80,000 tons of grain, they requested it be treated to prevent spoilage. Instead of using the grain as seed for their crops (where the methylmercury would not have caused harm) many farmers ignored the government's caution; they ground the grain into flour and ate it. This resulted in approximately 5,000 deaths and 50,000 cases of serious illness.

Effects on the Unborn

Investigations into the Iraqi poisonings showed that women who ate the grain during pregnancy delivered babies who suffered from retarded development. Even when the mother was not severely affected, the babies were.

"One of the most sensitive targets of toxic metals in our environment is the developing brain," Dr. Weiss explained.

Subtle Effects at Low Doses

Another well-known toxic metal is lead. Decades ago young children who consumed flakes of chipping paint were found to suffer from persistent hyperactivity, intellectual impairment and often retardation as a result of the lead poisoning.

Herbert Needleman, M.D., of the University of Pittsburgh, studied the harmful effects of lead by examining lead levels in the baby teeth of several thousand school-age children. (Measuring lead levels in teeth is a more accurate method than using blood samples because lead does not remain in the blood, as it does in the teeth.)

Bernard Weiss, Ph.D., addressed the delegates and guests at FAUS' 12th Annual Conference held in New York this past June.

Dr. Weiss is the Professor of Toxicology, Deputy Director, Environmental Health Services Center, at the University of Rochester School of Medicine in Rochester, NY.

This article is based on his address.

The lead levels were then compared with the children's test scores. Those children with the lowest levels of lead consistently achieved the highest test scores.

Dr. Weiss explained the importance of Needleman's work: "Even in children who showed no indication of lead toxicity, there was a direct relationship between tooth lead and scores on intelligence and several other psychological tests."

At low doses, far below the level at which one can detect obvious symptoms — toxic substances may cause harm.

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This was further confirmed by the work of David Bellinger, Ph.D., et al. Writing in the *New England Journal of Medicine,* Bellinger described a study testing 249 children from birth to age 2.

Lead levels were measured at the time of birth and the babies were divided into three groups determined by the levels of lead found. Tests to measure cognitive development were started at 6 months of age and the infants were assessed at six-month intervals.

"At all ages," Bellinger writes, "infants in the high-prenatal exposure group scored lower than infants in the other two groups."

The researchers found that development scores consistently correlated with the level of lead exposure measured at birth. Bellinger concluded, "It appears that the fetus may be adversely affected at blood lead concentrations well below . . . the level currently defined by the Centers for Disease Control as the highest acceptable level for your children." (*New England Journal of Medicine,* 1987;316:1037.)

The Effect Upon Our Society

Almost all of the babies in the Bellinger study came from upper middle class families, and even the high-lead group still had above average scores. A modest drop in test scores may not seem like a significant problem if you consider one child. But what are the implications for society as a whole?

"All of our models of risk are based on the risk of individuals," Dr. Weiss explained, "but I think that there is a societal risk as well that we have not taken account of."

He showed a graph which gave the current distribution of scores on a typical intelligence test, with 100 points representing the average score.

Out of a population of 100 million, 2.3 million children will score over 130 points. But if the median score is lowered only 5 percent, to 95, the figures shift drastically. Only 990,000 will then score in the high intellectual range, and there will be a great increase in the number of children who will have to receive special schooling or be institutionalized.

"In the 21st century that is a societal disaster!" Dr. Weiss emphasized. "The economic consequences are enormous. You can no longer talk about individual risk and set standards on that basis."

The Case Against Food Dyes

In 1985 the Committee on Drugs for the American Academy of Pediatrics published an article detailing a long list of known reactions brought about by the synthetic dyes ("food coloring") added to many drugs. (*Pediatrics,* Vol. 76, No. 4, October 1985.)

James Swanson, Ph.D., found that synthetic dyes impaired the learning ability of children. Researchers at Yale University reported that feeding dyes to newborn rats resulted in behavior which is "similar to attention deficit disorder with hyperactivity (ADD) observed in children." (*Annals of Neurology,* Vol. 4, No. 2, August 1978.)

The FDA study conducted by Weiss demonstrated that food dyes were capable of provoking hyperactive behavior in children, and that the youngest appear to suffer the greatest harm.

Applying the principles of toxicology, we can conclude that if dyes have an obvious effect on some children, then all children are at risk; and the developing brain of the very young is the most vulnerable target.

Assessing Risk vs. Benefit: an Editorial Comment

When cavemen hunted dangerous animals for food and clothing they took risks in order to gain benefits. Coal brought black lung disease and polluted air, but it kept people warm in the winter.

As our society became more complex, regulatory agencies were established to determine the risk vs. benefit of toxic substances and to decide which may be deliberately introduced into our environment, and in what amount.

Although dyes serve no essential nutritional purpose, they are added for marketing purposes to foods, beverages and medications consumed by most of our population, particularly children.

Newborn infants are given vitamins which contain synthetic dyes even though the added coloring serves no essential purpose. (They are very effective at leaving a permanent stain on linoleum countertops!)

And how many pediatric medications contain added dyes, synthetic flavorings, and so on? Nearly all of them. If the young child is vulnerable to the effects of these chemicals, then the sick youngster is at even greater risk.

Considering the Risk

In his closing remarks Dr. Weiss quoted the late Phillip Handler, a famous biochemist and head of the National Academy of Sciences:

"A sensible guide would surely be to reduce exposure to hazard whenever possible, to accept substantial hazard only for great benefit, minor hazard for modest benefit, and no hazard at all when the benefit seems relatively trivial."

Keeping the Holidays Happy

by Lee Rios

The holidays are approaching with all their hustle and bustle. During this time of year it is very easy to lose control of a diet . . . any diet!

But this is probably the worst time of the year to let things slide. The special days at school, vacation time, parties, visiting friends and relatives, and the holidays themselves have a disruptive effect on people. Imagine a food reaction added to the excitement of the holidays.

In the past I have been known to let my son "cheat" (always with a very good reason, of course). I'm often sorry afterward. It usually takes a build-up of the wrong foods to cause a noticeable reaction, but he sometimes has an immediate reaction which can include headaches, stomachaches, and asthma attacks.

During the holidays there are many opportunities to rationalize cheating. Then, the week before Christmas I receive detention notices from the school and calls from the teacher. Our "joyous" holidays turn into days marred by whining, irritable, physically ill kids (and adults).

One key to a happy holiday season is pre-planning. Start now and lay in a stock of approved goodies. My son and I have been making extra cookies and quick breads. We wrap them in individual servings and toss them into the freezer.

Before going shopping or visiting, we eat a good-sized meal. Cheating is less tempting when you're not hungry. And have some approved snacks stashed in the car when you go out. Then, if the hostess serves some inviting goodie or shopping takes longer than expected, there is a treat available. This is much more successful than "you can have a cookie when we get home."

I hope these hints will help make your holidays the best ones ever. And I'm going to try hard to follow my own advice!

Reprinted from FABA Facts, *the newsletter of the Feingold Association of the Bay Area*

Product Alert

Feingold PATH of New Jersey reports the Hershey Company is replacing the vanilla in its **Trail Bars** with synthetic vanilla (vanillin).

Roast Turkey

Remember to shop for a fresh or frozen turkey which is plain . . . not pre-basted. The "butter" added is generally oil which which has been dyed and artificially flavored.

. . . and cranberry sauce?

New members are encouraged to skip the cranberry sauce until they are ready to go on Stage Two of the diet. Although cranberries are not listed as one of the salicylate foods, Dr. Feingold found they affected some individuals, particularly those with eye-muscle disorder.

Cranberries and Blueberries

FAUS consulted the U.S. Department of Agriculture concerning the salicylate content of cranberries and blueberries. USDA informed us that cranberries and blueberries are members of the Vaccinium family of plants and thus contain benzoic acid, but should not contain salicylate.

In the study of salicylates in foods (*JADA '85*, pp. 951-958) Swain, Dutton and Truswell tested neither fresh blueberries nor fresh cranberries. However, they did test canned blueberry and cranberry products produced in Australia. All products tested contained considerable salicylate.

Due to numerous reported reactions they are listed on Stage Two of the Feingold diet.

Karen S. Garnett

EDITOR'S NOTE: These tests were done on Australian products and may not necessarily be representative of their American counterparts.

Word Gets Around

The Hyperactive Children's Support Group in England reports a new Feingold association has been formed in **West Africa.**

Best wishes to Mrs. Joanne Rogers and her colleagues in the Gold Coast.

Lois Gowans, Beamsville Canada Feingold Association

Show Your Colors!

In this case it's blue and white — the colors of our new canvas tote bags!

Measuring 14 by 10 by 5 inches, these sturdy bags will hold books, purchases, craft supplies, and of course, a hearty assortment of natural snacks to take along when you do your holiday shopping.

They make great gifts, especially when filled with Feingold-safe foods. (A hint for that reluctant relative you will be visiting?)

A portion of the purchase price will go toward funding our continuing efforts to educate your neighbors about our work and to make life easier for the Feingold member.

Tote bags are $5 each plus $1 shipping. For an order of two or more bags, the cost is $5 each and we will pay for the shipping. Please make check or money order payable to FAUS and mail to: FAUS Tote Bags, P.O. Box 6550, Alexandria, VA 22306.

Pure Facts

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"I want to help . . ."
Here's How

This issue of *Pure Facts* is about toxicology and babies. You are not likely to see them side by side in baby magazines or parenting books. But they are closely — and sometimes tragically — related.

Those who work with babies and are concerned about their needs may not be aware of the impact toxic substances can have on the developing infant.

You can help by sending us the names and addresses of people who may wish to have a copy of this issue.

Save Those School Papers

Do you have examples of your child's schoolwork "before" and "after" starting the Feingold program? Or do you have those telltale homework assignments that show there has been an infraction?

Some children show dramatic changes in handwriting, math, or spelling performance when they are on and off the diet. If you have papers like these, please consider sharing them with us.

Include your child's name, age, and date of the work, plus a description. This should explain whether the samples show "before & after" going on the diet, or if they represent "on the diet" and an infraction.

EPA Tests for Behavioral Effects

This information is based upon an interview with William Sette, Ph.D., Environmental Protection Specialist with the Office of Pesticide Programs at the U.S. government's Environmental Protection Agency.

The Environmental Protection Agency (EPA) requires fairly extensive testing procedures before a pesticide, herbicide, or fungicide is approved for use. This includes toxicological testing for skin or eye irritation and allergic responses, as well as testing for cancer and birth defects.

In conducting these experiments, researchers are also expected to be alert for any indications of behavioral changes in the test animals.

EPA is being petitioned to require that chemicals be systematically tested for behavioral effects. The petitioners are a coalition which includes: the American Psychological Association, the states of New York and Wisconsin, scientists, and consumer advocacy organizations.

The testing would result in a more thorough examination of the nervous system to measure the effects of the chemical exposure. Scientists would use a checklist to evaluate behavior as they observe and handle the animals. In addition, motor activity would be measured to determine if the substance behaves as a depressant or a stimulant.

Scientists can also test the effect a compound has on learning ability. This involves testing the animal's ability to perform a learned task — both before and after exposure to the chemical.

"I don't see any reason," Dr. Sette told* Pure Facts, *"why these techniques should not be applied to the testing of food additives."