

## ALLOXAN, A POISON THAT MAKES LAB RATS DIABETIC, MAY BE IN WHITE BREAD, CAKES AND COOKIES; SHOULD WE CARE?

By Luise Light, MS, Ed.D.

Recently, alarming reports in the blog-sphere warned that traces of the dangerous chemical alloxan, a toxic substance and a known carcinogen used by researchers to make lab rats diabetic, is present in white bread and other commercial baked goods (cookies, crackers, donuts, hamburger rolls) made with bleached white flour. Puzzled and disturbed by these reports, I set out to discover if it is true that alloxan really has been found in white bread, and if so, how it gets there, and whether, in the amounts found, it is a threat to people who eat foods made with bleached, wheat flour. What I've learned raises questions that both the milling industry and food safety regulators (EPA & FDA) must address, urgently.

First, let us agree that no ingredients that are known to cause cancer or diabetes when ingested belong in our food. While the risks may be small for some, for others the risks are just too great; especially, for pregnant women and their fetuses, people with compromised immune systems, and those with family histories of diabetes. If you belong in one of those high-risk categories, as tens of millions of North Americans do, you need to know what foods contain ingredients hazardous to you and to avoid them. However, in the case of alloxan, there are no ways to know, either by reading the ingredient lists on food labels or by any other means, that it might be in your food and that you need to avoid it.

According to Keith Emke, director of the Cargill Bakery Technology Development Center, freshly milled flour for commercial bread and cake baking is bleached with the chemical Benzoyl Peroxide to remove the yellow-colored carotenoids naturally present in flour. Wheat flours slated for making cakes and cookies are treated with chlorine gas to whiten, brighten and denature the proteins in the flour. Emke cited the example of Angel Food Cake that requires a white, light and fluffy cake flour. Almost all cake flour is bleached. Bleach toughens the protein molecules in the flour, enabling it to carry more than its weight in sugar and fat. Almost all cake flour is bleached. Bleach

The milling industry uses two chemicals to bleach, whiten and improve baking qualities, according to Emke, benzoyl peroxide to bleach the yellow carotenoid pigments naturally in flour and chlorine gas to whiten, disinfect and break down the protein structures in flour to improve baking qualities.

Although Jim Bair, vice president of the North American Millers Association, assured me that the use of chlorine has little to do with making flour white, the reason some flours are treated with chlorine, said Blair, is to improve their baking performance.

“Today, the US milling industry produces about 140 million pounds of flour each day, so there is no way to store the flour to allow it to age naturally. Plus there is a shelf life issue, says Bair. So chlorine gas is used to oxidize (or age) soft wheat flours and impart the same baking performance that natural aging would accomplish.”

Bair and other milling industry leaders claim that bleaching and oxidizing agents don't leave behind harmful residues in flour, although they can cite no studies or published data to confirm this. Chlorine gas and various oxides of chloride are believed to combine with the proteins in flour, producing alloxan as an unintended byproduct.

The Environmental Protection Agency (EPA) identifies chlorine gas as a flour-bleaching, aging and oxidizing agent that is a powerful irritant, dangerous to inhale, and lethal. At 30 parts per million it can cause coughing. EPA describes the carcinogenic chemicals that can be formed when chlorine is used in drinking water: carbon tetrachloride, and the compounds toluene, xylene and styrene, all known or suspected carcinogens.

## Bleaching Flour

It wasn't until the 20th century that chemical oxidizing agents and bleaches were developed to produce quick aging of wheat flour (within 48 hours); previously, it required several months for oxygen to condition flour naturally. Bleaching agents, when first introduced, were vehemently opposed. In fact, Harvey Wiley, Chief of the Food and Drug Administration, in the early 1900s (1908-1912), won a Supreme Court decision outlawing bleaches in flour. Unfortunately,

Wylie was forced out of the FDA, and the Supreme Court order was circumvented by the agency. Although permitted in Canada and the USA, many European countries ban the use of chemical bleaching and oxidation chemicals and other additives in bread completely.

Concerns about the chemical bleaching and whitening of wheat flours center around two claims of the wheat industry: The first claim is that the chemicals used for bleaching and oxidation are unstable and, after doing their jobs, do not remain in the flour. There is no available, independent data to show what, if anything, is detectable in flour, and to judge from experience with chlorination of water, highly toxic and carcinogenic substances can be formed and could be present, if only in trace amounts. Our ability to detect trace amounts of chemical byproducts of chlorine gas is much greater now than in previous eras, and tests could and should be done now to test this claim.

The second claim, exemplified by Professor Joe Schwarcz, director of the McGill University Office of Science and Society, states that a lot of alloxan is needed to produce cancer in lab rats. The amount of alloxan used to produce cancer in lab rats is about 40 mg per kg of body weight, given in a single dose. There is no available research to show that smaller doses over a longer term can have the same effect. Nobody has studied whether alloxan builds up in bleached flour nor in foods made with it. If it is present, Schwarcz conjectures, it would be in relatively small amounts comparable to the level of protein in unbleached flour.

But the amount of protein in cake flour, although much less than that in unbleached, naturally aged flour, is significant; cake flour contains between 5 to 8 % protein, unbleached flour (used in home bread-making) has between 12 and 13 % protein, and high-gluten flour (used in pizza crust, bagels) between 14–15% protein.. This suggests that , theoretically, alloxan could form in chlorine gas-treated flour because alloxan directly interacts with the protein in wheat flours, and the level of protein in cake flour is not in microgram but in gram amounts, 5 to 8 grams of protein per 100 grams of flour. There is no doubt that alloxan is a diabetogenic (causes diabetes). While dose is an important issue in toxicology, other factors are important, too: timing of the dose, and the vulnerability of individuals exposed.

Exposure of a fetus in utero, for example, can produce long-lasting effects at levels of toxin that produce no observable effects in adults. This is true for lead, mercury and PCBs, where exposure in parts per billion in the womb or during infancy has been shown to lower IQs. Many environmental chemicals have been studied and found to cause adverse health effects at extremely low doses. Alloxan, a toxic byproduct of wheat flour bleaching and oxidation, hasn't been studied in terms of human exposure. Proving that alloxan does or doesn't form in chemically bleached and aged wheat flour must be determined by independent scientists with no ties to the wheat industry. Our federal government is recommending more daily servings of breads and cereals than ever before (6 to 11 servings daily). Shouldn't we know that it's safe to eat these amounts?

Given our raging epidemic of diabetes in North America, we can't afford to be complacent about alloxan. But until bleached soft wheat flours are studied and found free of alloxan,, my advice is to follow the cautionary principal and stick to unbleached, whole grain breads and cereals, organic whenever possible.

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