

Abstract Category: Community Outreach

Optical Brighteners in Laundry Detergents: Assessment of Photodegradation and Potential Endocrine Disruption

Authors: Megan Hansen & Catherine Wang

Optical brighteners are potentially harmful chemicals used in certain laundry detergents, posing possible health risks to humans and the environment. When released into natural water systems through wastewater, optical brighteners' relatively low and unnoticed toxicities become compounded and cause devastating effects to fish and other organisms. Optical brighteners have also been shown to cause mutations in bacteria. Absorbing UV light and re-emitting it as blue light, optical brighteners counteract with dullness and, hence their name, "brighten" the clothing. However, this "brightening" is only an optical illusion- optical brighteners do not actually clean clothes, making them completely unnecessary.

When exposed to light, optical brighteners chemically break down. This is known as photodegradation, and it causes fluorescence to decrease. The purpose of this experiment was to measure and determine the optical brighteners' rate of light-caused degradation for different detergent brands under a controlled setting. A fluorometer measured the fluorescence, over time, of dilutions of the standard brand and 4 other brands. Each dilution was placed into three separate vials, two of which were left exposed to light and one of which was covered in aluminum foil. The two detergents containing the most optical brighteners (the standard and brand #2) displayed faster rates of photodegradation than the other three brands; this may be due to use of a different chemical as a brightening agent. The standard solution's fluorescence started at 81.62 units and had a net decrease of 32.04 units over 5 hours. The brand #2 solution's fluorescence decreased by 14.39 units from its initial 71.46 units. Overall, the results showed that optical brighteners degrade faster when exposed to light than when in the dark.

A wide variety of chemicals can serve as brightening agents, including stilbene-types, which have been linked with endocrine disruption and causing various cancers. Diethylstilbestrol (DES), a stilbene estrogen, was once FDA-approved for treating menopause and preventing miscarriages in women. However, it was eventually banned, once its carcinogenic properties and tendency to increase the risk of breast cancer were revealed and proven. Both DES and optical brighteners use stilbenes as chemical building blocks, making them more likely to share chemical properties.

Although the experiment conducted did not necessarily prove optical brighteners to be carcinogenic or to have harmful environmental effects, that does not mean that they cannot have possible detrimental consequences, nor does it mean we should find out the hard way.

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