2016 Children's Safe Products - Reporting Rule update
Draft Chemical Evaluation

CAS 80-09-1

Substance Name Bisphenol S **(BPS)** also 4,4'-Sulfonyldiphenol

Historical Summary

In 2011 Ecology did not find evidence of hazard or potential for exposure for Bisphenol S (BPS) [15].

Toxicity

EPA classified BPS as high hazard for toxicity from repeated exposure based on no-observed-adverse-effect-level (NOAEL) of 10 and 40 mg/kg-day in repeated dose rat studies [1]. A 28-day oral study of BPS in rats showed effects on body weight, increased kidney weight, hyperplasia and necrosis in mucosal epithelium of the cecum, and increased incidence of proteinuria and urobilinogen at 200 mg/kg-day. The NOAEL was 40 mg/kg-day [1].

EPA classified BPS as a moderate hazard for reproductive and developmental toxicity based on prolonged estrus cycle, decreased fertility index, decreased number of live offspring and liver effects observed at 300 mg/kg-day in a reproductive and developmental toxicity test in orally exposed rats. Although the NOAEL for reproductive effects was 60 mg-kg-day, pathology was noted at this dose in the cecum [1]. A recently reported 90-day oral study in rats also reported atrophy of mammary glands in male rats treated with at 300 mg/kg-day of BPS. This study also observed a dose-dependent increase in focal squamous cell metaplasia of glandular epithelium in the uterus of female rats across all doses (100, 300, and 1000 mg/kg-day) but it was unclear when the increase became statistically significant [2].

BPS has been assessed as part of the NTP's Tox21 High Throughput Screening Program, where it was classified as an estrogen agonist with some affinity for the estrogen receptor [3]. *In vitro* assays demonstrate that BPS can bind to estrogen receptors, elicit estrogen-induced gene transcription, and induce cell proliferation in MCF7 cancer cells, and inhibit the androgenic activity of dihydrotestosterone [1]. In a systematic review of BPS, BPA, and BPF endocrine studies, BPS had estrogenic activity in whole organism testing (Zebrafish, Daphnia magna) and in a number of *in vitro* tests. On average, BPS was about 1/3 as potent as BPA in estrogenic activity *in vitro* assays [4].

Exposure

BPS exposures can occur through oral, dermal, or inhalation routes, however, primary exposure likely occurs through the oral route. Information on distribution in the body, metabolism, and excretion is mostly lacking [3].

Washington State banned BPA for use in baby bottles, infant sippy cups and sports water bottles starting in 2010 (Washington State Law; Chapter 70.280 RCW). BPS is used as a replacement for BPA in polymer production and thermal papers. BPS is used in polyethersulfone (PES) plastics used to make baby bottles [3,5,6]. BPS has been detected in personal care products [7], and sales receipt paper and other paper products [8,9]. National U.S. production volume was reported to be 1-10 million pounds in 2012 [10].

BPS was found in 81% of the human urine samples analyzed from general populations in the United States and several Asian countries collected in 2010-11. Urine concentrations in U.S. samples had a

median of 0.26 ng/mL and a maximum detection of 21 ng/mL [11]. In another biomonitoring study, archived urine samples from U.S. adults collected from 2000-2014 showed increasing levels of BPS over time[12]. BPS was also measured in the serum and urine of cashiers and a control group of adults in a North Carolina study. Urinary levels of BPS were higher in cashiers following a shift handling receipt paper that contained BPS [9]. BPS was detected in 100% of 38 indoor dust samples collected in NY State in 2006 and 2010. Median detected concentration was 630 ng/g dust and the maximum was 25,500 ng/g dust [13]. BPS has also been found in a variety of foods collected from retail grocery stores in Albany, NY in 2008-2010. It was detected in 43% of meats and meat products and about ¼ of seafood, fruit and vegetable samples [14].

BPS was considered to have moderate persistence and low potential for bioaccumulation by EPA [1].

References

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