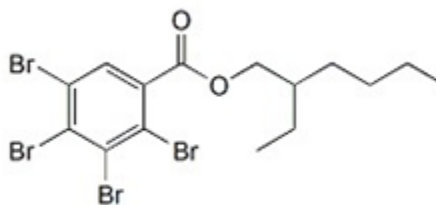


CAS 183658-27-7

2-ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB)

$C_{15}H_{18}Br_4O_2$



Summary of Health Effects

TBB may cause problems with development in animals and humans. It may also harm their reproductive and nervous systems.

How is TBB used?

TBB has been used as a substitute ingredient for polybrominated flame retardants (PBDEs) in flexible polyurethane foam. These materials are typically found in consumer products such as upholstered furniture, auto cushions, and baby products, and remain in products containing recycled polyurethane foam.¹⁻³ TBB and TBPH make up about 50% of the widely used flame retardant mixture Firemaster 550. Other flame retardants (TPP and IPTPP) are also components of Firemaster 550.⁴

Toxicity: What are its health effects?

Due to the observed toxicity of mixtures containing TBB and that of a closely related chemical analog, the U.S. Environmental Protection Agency (EPA) has characterized TBB as a moderate hazard for neurological, developmental, reproductive and repeated dose toxicities.⁴

Pregnant rats fed a commercial mixture containing TBB showed altered thyroid function, and significantly increased weights in offspring. Also, early puberty in female pups and significantly increased left ventricular

thickness and blood glucose levels in male pups was noted.⁵

Exposure: How can a person come in contact with it?

A person may come in contact with TBB by breathing in or eating contaminated dust, or from skin contact with consumer products. Metabolites of TBB have been detected in the breast milk of women living in Quebec, Canada from 2009-2010 and in the urine of mothers and their toddlers from California and New Jersey.^{6,7}

Indoor dust was sampled from 39 childcare facilities in Northern California and TBB was detected in 100% of the samples.⁸

TBB has also been detected in dust collected from college dormitories in New England.⁹ Studies have found increased levels of TBB on hand wipe samples taken from U.S. collegiate gymnasts after practice as compared to before.¹⁰

TBB was detected in all dust samples and 95% of the handwipe samples gathered from New York City homes of children and mothers.¹¹ A 2014 Indiana biomonitoring study detected TBB in the blood, hair and nails of adults.¹² TBB was added to EPA's 2014 Toxic Substance Control Act work plan due to developmental, acute and chronic toxicity, and moderate

environmental persistence and bioaccumulation potential.¹³

References

1. U.S. Environmental Protection Agency (2014). *TSCA Work plan for chemical assessments: 2014 update*. Environmental Protection Agency, Office of Chemical Safety and Pollution Prevention. Retrieved from www.epa.gov/sites/production/files/2015-01/documents/tsca_work_plan_chemicals_2014_update-final.pdf
2. Stapleton, H.M., Klosterhaus, S., Keller, A., Ferguson, P.L., van Bergen, S., Cooper, E., Webster, T.F., Blum, A. (2011). Identification of flame retardants in polyurethane foam collected from baby products. *Environmental Science & Technology*, 45, 5323-5331.
3. La Guardia, M.J. & Hale, R.C. (2015). Halogenated flame-retardant concentrations in settled dust, respirable and inhalable particulates and polyurethane foam at gymnastic training facilities and residences. *Environ Int.*, 79, 106-14.
4. U.S. Environmental Protection Agency (2015). *Flame retardants used in flexible polyurethane foam: An alternatives assessment update*. U.S. Environmental Protection Agency. Retrieved from www.epa.gov/sites/production/files/2015-08/documents/ffr_final.pdf
5. Patisaul, H.B., Roberts, S.C., Mabrey, N., McCaffrey, K.A., Gear, R.B., Braun, J., Belcher, S.M., and Stapleton, H.M. (2012). Accumulation and endocrine disrupting effects of the flame retardant mixture Firemaster((R)) 550 in rats: An exploratory assessment. *Journal of Biochemical and Molecular Toxicology*, 27, 124–136.
6. Butt, C.M., et al. (2014). Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. *Environ Sci Technol*, 48(17), 10432-8.
7. Butt, C.M., Congleton, J., Hoffman, K., Fang, M.L., Stapleton, H.M. (2014). Metabolites of organophosphate flame retardants and 2-ethylhexyl tetrabromobenzoate in urine from paired mothers and toddlers. *Environmental Science & Technology*, 48, 10432–10438.
8. Bradman, A., Castorina, R., Gaspar, F., Nishioka, M., Colon, M., Weathers, W., Egeghy, P.P., Maddalena, R., Williams, J., Jenkins, P.L. and McKone, T.E. (2014). Flame Retardant Exposures in California Early Childhood Education Environments. *Chemosphere*, 116, 61–66.
9. Dodson, R.E., Rodgers, K.M., Carey, G., Guillermo, J., Laurent, C., Covaci, A., Poma, G., Malarvannan, G., Spengler, J.D., Rudel, R.A., & Allen, J.G. (2017). Flame retardant chemicals in college dormitories: flammability standards influence dust concentrations. *Environmental Science & Technology*, 51, 4860-4869.
10. Carignan, C.C., Heiger-Bernays, W., McClean, M.D., Roberts, S.C., Stapleton, H.M., Sjödin, A., Webster, T.F. (2013). Flame retardant exposure among collegiate U.S. gymnasts. *Environmental Science & Technology*, 47, 13848–13856.
11. Cowell, W.J., Stapleton, H.M., Holmes, D., Calero, L., Tobon, C., Perzanowski, M., & Herbstman, J.B. (2017). Prevalence of historical and replacement brominated flame retardant chemicals in New York City homes. *Emerging Contaminants*, 3, 32-39.
12. Liu, L., He, K., Hites, R.A., & Salamova, A. (2016). Hair and nails as noninvasive biomarkers of human exposure to brominated and organophosphate flame retardants. *Environmental Science & Technology*, 50, 3065-3073.
13. U.S. Environmental Protection Agency (2015). *TSCA Work plan chemical problem formulation and initial assessment - Chlorinated phosphate ester cluster flame retardants*. Environmental Protection Agency. Retrieved from www.epa.gov/sites/production/files/2015-09/documents/cpe_fr_cluster_problem_formulation.pdf