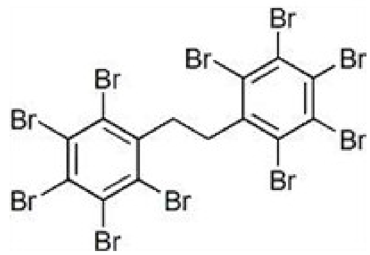
CAS 84852-53-9

Decabromodiphenyl ethane (DBDPE)

$C_{14}H_4Br_{10}$

VERMONT DEPARTMENT OF HEALTH



Summary of Health Effects

DBDPE may harm development and the nervous system. Studies showed animals fed DBDPE had changes in hormone levels and harm to their vascular and cardiac systems.

How is DBDPE used?

DBDPE is often used as a replacement for the flame retardant decaBDE.[1,2,3] DBDPE is a high production volume chemical[4] used in electrical and automotive materials, as well as textiles and fabrics as an additive flame retardant.[1]
In 2013, a third of baby formula and a fourth of baby cereal samples contained DBDPE in a U.S. study.[5] The Washington Department of Ecology detected DBDPE in consumer products including plastics, padding, stuffing and foam.[6] A study detected DBDPE in rubber, hard and soft plastic, foam, and stuffed children's products for sale in China.[7]

Toxicity: What are its health effects?

Based on the toxicity of a closely related structural analog, the U.S. Environmental Protection Agency (EPA) considered DBDPE as a high hazard for developmental toxicity and neurotoxicity.[1]

Animal studies have shown disruption of the endocrine system and vascular and cardiac toxicity in rodents treated with DBDPE.[2,8-11]

Animal studies reported changes in thyroid hormone levels, indicating disrupted thyroid balance, and damage to the thyroid gland in rats fed DBDPE.[2, 8-10] DBDPE treatment in rats caused heart and abdominal aorta damage as well as endothelial cell dysfunction.[11]

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

A person can come in contact with DBDPE by breathing in contaminated air or dust, eating contaminated food or dust, or by skin contact with contaminated dust or consumer products containing DBDPE.

The EPA has characterized DBDPE to have a very high potential for environmental persistence evidenced by biodegradation study results.[1] DBDPE has been characterized by the EPA to have high potential for bioaccumulation based on environmental monitoring data.[1] DBDPE has been shown to bioaccumulate in liver, kidney, and adipose tissue in rodents.[2]

DBDPE has been detected throughout the environment in wildlife, house dust, and indoor and outdoor air.[3,12-18]

In 2015, the California Biomonitoring program added DBDPE as a priority chemical.[19] In a 2008-2009 Canadian study, DBDPE was detected in maternal blood serum and breast milk.[17] DBDPE has also been detected in hair and umbilical cord blood.[20,21]

References

1. U.S. Environmental Protection Agency (2014). *An alternatives assessment for the flame retardant decabromodiphenyl ether (DecBDE)*. U.S. Environmental Protection Agency. Retrieved from www.epa.gov/saferchoice/partnership-evaluate-flame-retardant-alternatives-decabde.
2. Wang, F., Wang, J., Dai, J.Y., Hu, G.C., Wang, J.S., Luo, X.J., Mai, B.X. (2010). Comparative tissue distribution, biotransformation and associated biological effects by decabromodiphenyl ethane and decabrominated diphenyl ether in male rats after a 90-day oral exposure study. *Environmental Science & Technology*, 44, 5655–5660.
3. Brown, F. R., Whitehead, T. P., Park, J. S., Metayer, C., Petreas, M. X. (2014). Levels of non-polybrominated diphenyl ether brominated flame retardants in residential house dust samples and fire station dust samples in California. *Environmental Research,* 135, 9–14.
4. Organization for Economic Development Environment Directorate (2004). *The 2004 OECD list of high production volume chemicals*. Retrieved from www.oecd.org/chemicalsafety/risk-assessment/33883530.pdf
5. Liu, L.Y., Salamova A., Hites R.A. (2014). Halogenated flame retardants in baby food from the United States and from China and the estimated dietary intakes by infants*. Environmental Science & Technology*, 48(16), 9812-8.
6. Washington Department of Ecology. *Consumer Product Testing Database.* Washington State Department of Ecology. Retrieved from fortress.wa.gov/ecy/ptdbpublicreporting.
7. Chen, S.J., Ma, Y.J., Wang, J., Chen, D., Luo, X.J., Mai, B.X. (2009). Brominated flame retardants in children's toys: concentration, composition, and children's exposure and risk assessment. *Environmental Science & Technology*, 43, 4200–4206.
8. Sun, R., Xi, Z., Zhang, H., & Zhang, W. (2014). Subacute effect of decabromodiphenyl ethane on hepatotoxicity and hepatic enzyme activity in rats. *Biomedical and Environmental Sciences*, 27(2), 122-125. doi:10.3967/ bes2014.026
9. Sun, R., Shang, S., Zhang, W., Lin, B., Wang, Q., Shi, Y., & Xi, Z. (2018). Endocrine disruption activity of 30-day dietary exposure to decabromodiphenyl ethane in Balb/C mouse. *Biomedical and Environmental Sciences,* 31(1), 12-22. doi:10.3967/bes2018.002
10. Wang, Y., Chen, T., Sun, Y., Zhao, X., Zheng, D., Jing, L., . . . Shi, Z. (2019). A comparison of the thyroid disruption induced by decabrominated diphenyl ethers (BDE-209) and decabromodiphenyl ethane (DBDPE) in rats. *Ecotoxicology and Environmental Safety,* 174, 224-235. Retrieved from doi.org/10.1016/j.ecoenv.2019.02.080
11. Jing, L., Sun, Y., Wang, Y., Liang, B., Chen, T., Zheng, D., . . . Shi, Z. (2019). Cardiovascular toxicity of decabrominated diphenyl ethers (BDE-209) and decabromodiphenyl ethane (DBDPE) in rats. Chemosphere, 223, 675-685. Retrieved from doi.org/10.1016/j.chemosphere.2019.02.115
12. Stapleton, H.M., Allen, J.G., Kelly, S.M., Konstantinov, A., Klosterhaus, S., Watkins, D., McClean, M.D., Webster, T.F. (2008). Alternate and new brominated flame retardants detected in U.S. house dust. *Environmental Science & Technology*, 42, 6910–6916.
13. Dodson, R.E., Perovich, L.J, Covaci, A., Van den Eede, N., Ionas, A.C., Dirtu, A.C., Brody, J. G., Rudel, R.A. (2012). After the PBDE phase-out: A broad suite of flame retardants in repeat house dust samples from California. *Environmental Science & Technology*, 46, 13056–13066.
14. Harrad, S., Ibarra, C., Abdallah, M.A-E., Boon, R., Neels, H., Covaci, A. (2008). Concentrations of brominated flame retardants in dust from United Kingdom cars, homes, and offices: causes of variability and implications for human exposure. *Environment International*, 34(8), 1170–1175.

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15. Law, R.J., Herzke, D., Harrad, S., Morris, S., Bersuder, P., Allchin, C.R. (2008). Levels and trends of HBCD and BDEs in the European and Asian environments, with some information for other BFRs. *Chemosphere*, 73(2), 223–241.

16. Mo, L., Wu, J. P., Luo, X. J., Zou, F. S., Mai, B. X. (2012). Bioaccumulation of polybrominated diphenyl ethers, decabromodiphenyl ethane, and 1,2-bis(2,4,6-tribromophenoxy) ethane flame retardants in kingfishers (*Alcedo atthis*) from an electronic waste-recycling site in South China. *Environmental Toxicology and Chemistry*, 31(9), 2153–2158.

17. Zhou, S.N., Buchar, A., Siddique, S., Takser, L., Abdelouahab, N., Zhu, J. (2014). Measurements of selected brominated flame retardants in nursing women: implications for human exposure. *Environmental Science & Technology*, 48, 8873–80.

18. Ricklund, N., Kierkegaard, A., Mclachlan, M.S. (2010). Levels and potential sources of decabromodiphenyl ethane (DBDPE) and decabromodiphenyl ether (DecaBDE) in lake and marine sediments in Sweden. *Environmental Science & Technology*, 44, 1987–1991.

19. California Environmental Contaminant Biomonitoring Program. *List of Priority Chemicals, December 2015.* Retrieved from biomonitoring.ca.gov/sites/default/files/downloads/PriorityChemicalsList_December2015.pdf.

20. Leung, M., Nøst, T.H., Wania, F., Papp, E., Herzke, D., Al Mahmud, A., Roth, D.E. (2018). Maternal-child exposures to persistent organic pollutants in Dhaka, Bangladesh. *Exposure and Health*, 1-9. doi.org/10.1007/s12403-018-0286-x

21. Zheng, J., Luo, X., Yuan, J., Wang, J., Wang, Y., Chen, S., Mai, B., Yang, Z. (2011). Levels and sources of brominated flame retardants in human hair from urban, e-waste, and rural areas in South China. *Environmental Pollution*, 159, 3706-13. doi 10.1016/j.envpol.2011.07.009.

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