Evaluation of dioxin-like activities in settled house dust from vietnamese e-waste recycling sites: Relevance of polychlorinated/brominated dibenzo- p -dioxin/furans and dioxin-like PCBs

Tue N.M., Suzuki G., Takahashi S., Isobe T., Trang P.T.K., Viet P.H., Tanabe S.

Center for Marine Environmental Studies, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan; Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba 305-8506, Japan; Senior Research Fellow Center, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan; Centre for Environmental Technology and Sustainable Development, Hanoi University of Science, 334 Nguyen Trai, Hanoi, Viet Nam

Abstract: Few studies have investigated the human exposure to the ensemble of dioxin-related compounds (DRCs) released from uncontrolled e-waste recycling, especially from a toxic effect standpoint. This study evaluated the TCDD toxic equivalents (TEQs) in persistent extracts of settled house dust from two Vietnamese e-waste recycling sites (EWRSs) using the Dioxin-Responsive Chemically Activated LUciferase gene eXpression assay (DR-CALUX), combined with chemical analysis of PCDD/Fs, DL-PCBs, PBDD/Fs, and monobromo PCDD/Fs to determine their TEQ contribution. The CALUX-TEQ levels in house dust ranged from 370 to 1000 pg g^{-1} in the EWRSs, approximately 3.5-fold higher than in the urban control site. In EWRS house dust, the concentrations of the unregulated PBDFs were 7.7-63 ng g^{-1}, an order of magnitude higher than those of regulated DRCs (PCDD/Fs and DL-PCBs), and PBDFs were also principal CALUX-TEQ contributors (4.2-22%), comparable to PCDD/Fs (8.1-29%). The CALUX-TEQ contribution of DRCs varied, possibly depending on thermal processing activities (higher PCDD/F-TEQs) and PBDE content in the waste (higher PBDF-TEQs). However, the percentage of unknown dioxin-like activities was high in all dust samples, indicating large contribution from unidentified DRCs and/or synergy among contaminants. Estimates of TEQ intake from dust ingestion suggest that children in the EWRSs may be adversely affected by DRCs from dust. ?? 2010 American Chemical Society.

Index Keywords: Chemically activated LUciferase gene expressions; Control sites; Dioxin-like PCBs; Dl-PCBs; Dust ingestion; Dust samples; e-Waste; House dust; Human exposures; Order of magnitude; PCDD/Fs; Related compounds; Thermal processing; Toxic effect; Toxic Equivalents TEQ; Chemical analysis; Gene expression; Houses; Polychlorinated biphenyls; Recycling; Toxic materials; Wastes; Dust; dioxin; polybrominated dibenzofuran; polychlorinated biphenyl; polychlorinated dibenzodioxin; chemical analysis; gene expression; health risk; industrial emission; ingestion rate; particulate matter; PCB; PCDD; pollution exposure; recycling; toxicity; article; chemical analysis; dioxin responsive chemically activated luciferase gene expression assay; genetic analysis; house dust; recycling; thermal analysis; urban area; Viet Nam; Viet Nam

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Authors with affiliations:

1. Tue, N.M., Center for Marine Environmental Studies, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan
2. Suzuki, G., Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba 305-8506, Japan
3. Takahashi, S., Center for Marine Environmental Studies, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan
4. Isobe, T., Senior Research Fellow Center, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan
5. Trang, P.T.K., Centre for Environmental Technology and Sustainable Development, Hanoi University of Science, 334 Nguyen Trai, Hanoi, Viet Nam
6. Viet, P.H., Centre for Environmental Technology and Sustainable Development, Hanoi University of Science, 334 Nguyen Trai, Hanoi, Viet Nam
7. Tanabe, S., Center for Marine Environmental Studies, Ehime University, 2-5 Bunkyo-cho, Matsuyama 790-8577, Japan

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