

Contamination by polybrominated diphenyl ethers and persistent organochlorines in catfish and feed from Mekong River Delta, Vietnam

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Abstract: Commercial feeds for aquaculture and catfish samples were collected from the Mekong River Delta, Vietnam, for determination of polybrominated diphenyl ethers (PBDEs) and selected persistent organochlorines, including polychlorinated biphenyls (PCBs), DDT and its metabolites (DDTs), chlordane-related compounds (CHLs), hexachlorocyclohexane isomers (HCHs), and hexachlorobenzene (HCB). The most abundant contaminants were DDTs, with concentrations ranging from 10 to 700 ng/g lipid weight, followed by PCBs (1.0-80 ng/g), CHLs (Author Keywords: Aquaculture feed; Dumping site; Fish; Organochlorines; Polybrominated diphenyl ethers

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References:

1. Colborn, T., Vom Saal, F.S., Soto, A.M., Developmental effects of endocrine-disrupting chemicals in wildlife and humans (1993) *Environ Health Perspect*, 101, pp. 378-384
2. Cheek, A.O., Kow, K., Chen, J., McLachlan, J.A., Potential mechanisms of thyroid disruption in humans: Interaction of organochlorine compounds with thyroid receptor, transthyretin, and thyroid-binding globulin (1999) *Environ Health Perspect*, 107, pp. 273-278
3. (2001) Stockholm Convention on Persistent Organic Pollutants, , Report May 22. Geneva, Switzerland
4. Sinh, N.N., Thuy, L.T.B., Kinh, N.K., Thang, L.B., The persistent organic pollutants and their management in Vietnam (1999) *Proceedings, Regional Workshop on the Management of Persistent Organic Pollutants - POPs*, pp. 385-406. , United Nations Environment Program, Hanoi, Vietnam, March 16-19
5. Nhan, D.D., Carvalho, F.P., Am, N.M., Tuan, N.Q., Yen, N.T.H., Villeneuve, J.P., Cattini, C., Chlorinated pesticides and PCBs in sediments and mollusks from freshwater canals in Hanoi, Vietnam (2001) *Environ Pollut*, 112, pp. 311-320
6. Minh, T.B., Kunisue, T., Yen, N.T.H., Watanabe, M., Tanabe, S., Hue, N.D., Qui, V., Persistent organochlorine residues and their bioaccumulation profiles in resident and migratory birds from North Vietnam (2002) *Environ Toxicol Chem*, 21, pp. 2108-2118
7. Minh, N.H., Someya, M., Minh, T.B., Kunisue, T., Watanabe, M., Tanabe, S., Viet, P.H., Tuyen, B.C., Persistent organochlorine residues in human breast milk from Hanoi and Ho Chi Minh City, Vietnam: Contamination, accumulation kinetics, and risk assessment for infants (2004) *Environ Pollut*, 129, pp. 431-441
8. Bignert, A., Olsson, M., Persson, W., Jensen, S., Zakrisson, S., Litz??n, K., Eriksson, U., Alsberg, T., Temporal trends of organochlorines in Northern Europe, 1967-1995. Relation to global fractionation, leakage from sediments, and international measures (1998) *Environ Pollut*, 99, pp. 177-198
9. Hites, R.A., Polybrominated diphenyl ethers in the environment and in people: A meta-analysis of concentrations (2004) *Environ Sci Technol*, 38, pp. 945-956
10. Hale, R.C., Guardia, M.J.L., Harvey, E.P., Gaylor, M.O., Mainor, T.M., Duff, W.H., Persistent pollutants in land-applied

sludges (2001) *Nature*, 412, pp. 140-141

11. Darnerud, P.O., Toxic effects of brominated flame retardants in man and in wildlife (2003) *Environ Int*, 29, pp. 841-853
12. Hakk, H., Letcher, R.J., Metabolism in the toxicokinetics and fate of brominated flame retardants - A review (2003) *Environ Int*, 29, pp. 801-828
13. Watanabe, I., Sakai, S., Environmental release and behavior of brominated flame retardants (2003) *Environ Int*, 29, pp. 665-682
14. (2005) Mekong River Commission Environmental Training Kit, , Mekong River Commission. Vientiane, Laos
15. Agusa, T., Kunito, T., Nakashima, E., Minh, T.B., Tanabe, S., Subramanian, A., Viet, P.H., Preliminary on trace element contamination in dumping sites of municipal wastes in India and Vietnam (2003) *Journal de Physique (IV)*, 107, pp. 21-24
16. Minh, N.H., Minh, T.B., Watanabe, M., Kunisue, T., Monirith, I., Tanabe, S., Sakai, S., Prudente, M., Open dumping site in Asian developing countries: A potential source of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (2003) *Environ Sci Technol*, 37, pp. 1493-1502
17. Andriesz, P., Aquaculture in Vietnam (2000) *Global Aquaculture Advocate*, 3, pp. 36-38
18. Kajiwara, N., Ueno, D., Monirith, I., Tanabe, S., Pourkazemi, M., Aubrey, D.G., Contamination by organochlorine compounds in sturgeons from Caspian Sea during 2001 and 2002 (2003) *Mar Pollut Bull*, 46, pp. 741-747
19. Ueno, D., Kajiwara, N., Tanaka, H., Subramanian, A., Fillmann, G., Lam, P.K.S., Zheng, G.J., Tanabe, S., Global pollution monitoring of polybrominated diphenyl ethers using skipjack tuna as a bioindicator (2004) *Environ Sci Technol*, 8, pp. 2312-2316
20. Kannan, K., Tanabe, S., Tatsukawa, R., Geographical distribution and accumulation features of organochlorines residues in fishes from tropical Asia and Oceania (1995) *Environ Sci Technol*, 29, pp. 2673-2683
21. Minh, N.H., Minh, T.B., Kajiwara, N., Kunisue, T., Subramanian, A., Iwata, H., Tanabe, S., Tuyen, B.C., Contamination by persistent organic pollutants in dumping sites of Asian developing countries: Implication of emerging pollution sources (2006) *Arch Environ Contam Toxicol*, 50, pp. 474-481
22. Iwata, H., Tanabe, S., Sakai, N., Nishimura, A., Tatsukawa, R., Geographical distribution of persistent organochlorines in air, water, and sediments from Asia and Oceania and their implications for global redistribution from lower latitudes (1994) *Environ Pollut*, 85, pp. 15-33
23. Jacobs, M.N., Covaci, A., Schepens, P., Investigation of selected persistent organic pollutants in farmed Atlantic salmon (*Salmo salar*), salmon aquaculture feed, and fish oil components of the feed (2002) *Environ Sci Technol*, 36, pp. 2797-2805
24. Ramesh, A., Tanabe, S., Kannan, K., Subramanian, A.N., Kumaran, P.L., Tatsukawa, R., Characteristic trend of persistent organochlorine contamination in wildlife from a tropical agricultural watershed, South India (1992) *Arch Environ Contam Toxicol*, 23, pp. 26-36
25. Dodder, N.G., Strandberg, B., Hites, R.A., Concentrations and spatial variations of polybrominated diphenyl ethers and several organochlorine compounds in fishes from the Northeastern United States (2002) *Environ Sci Technol*, 36, pp. 146-151
26. Oliver, B.G., Niimi, A.J., Trophodynamic analysis of polychlorinated biphenyl congeners and other chlorinated hydrocarbons in the lake Ontario ecosystem (1998) *Environ Sci Technol*, 22, pp. 388-397
27. Moon, J.W., Kim, Y.B., Lee, S.I., Song, H., Choi, K., Jeong, G.H., Distribution characteristics of polychlorinated biphenyls in crucian carp (*Carassius auratus*) from major rivers in Korea (2006) *Chemosphere*, 62, pp. 430-439
28. Das, B., Khan, Y.S.A., Das, P., Shaheen, S.M., Organochlorine pesticide residues in catfish, *Tachysurus thalassinus* (Ruppell, 1835), from the south patches of the Bay of Bengal (2002) *Environ Pollut*, 120, pp. 255-259
29. Norena-Barroso, E., Sima-Alvarez, R., Gold-Bouchot, G., Zapata P??rez, O., Persistent organic pollutants and histological

- lesions in Mayan catfish *Ariopsis assimilis* from the Bay of Chetumal, Mexico (2004) *Mar Pollut Bull*, 48, pp. 263-269
30. Johnston, T.A., Fisk, A.T., Whittle, D.M., Muir, D.C.G., Variation in organochlorine bioaccumulation by a predatory fish
 31. gender, geography, and data analysis methods (2002) *Environ Sci Technol*, 20, pp. 4238-4244
 32. (2003) Canadian Quality Guidelines for the Protection of Aquatic Life, , Canadian Council of Minister of the Environment. Winnipeg, MB, Canada
 33. (2006) Food Balance Sheet, , Food and Agriculture Organization of The United Nations. Statistic Division, Rome, Italy
 34. Kannan, K., Tanabe, S., Quynh, H.T., Hue, N.D., Tatsukawa, R., Residue pattern and dietary intake of persistent organochlorine compounds in foodstuff from Vietnam (1992) *Arch Environ Contam Toxicol*, 22, pp. 367-374
 35. Zennegg, M., Kohler, M., Gerecke, A.C., Schmid, P., Polybrominated diphenyl ethers in whitefish from Swiss lakes and farmed rainbow trout (2002) *Chemosphere*, 51, pp. 545-553
 36. Rayne, S., Ikonomou, M.G., Antcliffe, B., Rapidly increasing polybrominated diphenyl ether concentrations in the Columbia River system from 1992 to 2000 (2003) *Environ Sci Technol*, 37, pp. 2847-2854
 37. Boon, J.P., Lewis, W.E., Tjoen-A-Choy, M.R., Allechin, C.R., Law, R.J., De Boer, J., Hallers-Tjabbes, C.C., Zegers, B.N., Levels of polybrominated diphenyl ether (PBDE) flame retardants in animals representing different trophic levels of the North Sea food web (2002) *Environ Sci Technol*, 36, pp. 4025-4032
 38. Easton, M.D.L., Luszniak, D., Geest, E.D., Preliminary examination of contaminant loadings in farmed salmon, wild salmon, and commercial salmon feed (2002) *Chemosphere*, 46, pp. 1053-1074
 39. Monirith, I., Nakata, H., Tanabe, S., Tana, T.S., Persistent organochlorine residues in marine and freshwater fish in Cambodia (1998) *Mar Pollut Bull*, 38, pp. 604-612
 40. Nakata, H., Hirakawa, Y., Kawazoe, M., Nakabo, T., Arizono, K., Sh, A., Kitano, T., Ding, X., Concentrations and compositions of organochlorine contaminants in sediments, soils, crustaceans, fishes and birds collected from Lake Tai, Hangzhou Bay and Shanghai city region, China (2005) *Environ Pollut*, 133, pp. 415-429
 41. Guruge, K.S., Tanabe, S., Fukuda, M., Yamagishi, S., Tatsukawa, R., Accumulation pattern of persistent organochlorine residues in common cormorants (*Phalacrocorax carbo*) from Japan (1997) *Mar Pollut Bull*, 34, pp. 186-193

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