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Rapid Discovery and Identification of PBDEs Biomarkers Using SELDI Proteinchip Platform: Serum Apolipoprotein A-I as a Potential Biomarker for PBDEs

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Polybrominated diphenyl ethers (PBDEs) have been widely used as flame retardants and suppress the brain and sexual development when exposed young age. Useful biomarkers are needed for early detection of PBDEs exposure and for understanding their toxic mechanism. We investigated protein biomarker candidates from serum and tissues of weanling rats commercial PBDEs, DE-71. Male Wistar rats, 28 days old, were exposed orally to 3, 30 and 100 mg/kg bw PBDEs for 14 days. Protein profiling and time-course change were examined using proteinchip platform, based on surface enhanced laser desorption/ionization (SELDI) time-of-flight mass spectrometry. Candidate protein was identified by peptide mapping using LC/Q-TOF and MALDI-TOF and conformed by western blotting. 11.3, 16.9 and 33.8 kDa proteins in serum were significantly expressed at 14 days of PBDEs (30 and 100 mg/kg) exposure. 20.8 and 25.6 kDa proteins in liver and 15.2 and 15.9 proteins in thyroid gland were changed significantly by PBDEs. All of these proteins were recovered to normal range at 21 days after PBDEs withdrawal. In brain, protein expression profiles showed no significant changes. Three candidate serum proteins were not expressed at equivalent toxic dose of PCBs (4 mg/kg), 2,3,7,8-TCDD (1.5 μ g/kg) and propylthiouracil (240 mg/kg). The purification condition for 33.4 kDa protein biomarker was optimized as adsorption with pH 7.0 HEPES buffer and desorption with the same buffer containing 300 mM NaCl. The purified 33.4 kDa protein was identified as apolipoprotein A-I precursor (ApoA-I) by peptide mapping with LC/Q-TOF and MALDI-TOF mass spectrometry and confirmed by western blot assay. These results indicate that ApoA-I and other protein profiles in serum and tissues could be potential biomarkers for PBDEs exposure and that the ProteinChip platform could be used as a strong tool for the rapid and reliable discovery of biomarkers.

Keyword: PBDEs, Biomarker, Protein chip, SELDI-TOF/MS, Apolipoprotein A-I