DETERMINATION OF PCDD/PCDF IN SOIL AND WATER SAMPLES FROM SOUTH VIETNAM REGIONS SPRAYED WITH AGENT ORANGE BY GC-MS

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Quantitation of residual PCDD/PCDF congeners and organochemical ecotoxicants in the environment and in human tissues is required to provide an insight into ecological and health consequences of dioxin-contaminated phytotoxicants sprayed during the II Indochina war in the South Vietnam. These data facilitates precise definition of the polluted zones, exposed contingents, and routes of exposure from the environment, evaluation of current chronic exposure rates for dioxin and interferring chemicals. Analytical GC-MS studies were initiated at the Vietnam-Soviet Tropical Centre for this purpose.

Soil samples rich in the organochlorine compounds were collected in a place of Agent Orange (belonged to the US Air Forces) storage at the military airport Binh Hoa for a pilot study.

GC-LRMS assessment of the organochemicals extracted with benzene (5-10 ng /13/C6-1,2,3,4-TCDD were added as an internal standard to 50 g soil) and pre-purified on cieselgel-natrium sulfate-kalium silicate-sulfuric acid-impregnated cieselgel columns was carried out using a HP 5890A gas chromatograph equipped with a Finnigan ITD 700 ion trap MS detector coupled to a PC-AT computer (mass-spectra library), and a 25 m x 0.25 mm SPB -5 bonded phase fused quartz capillary column. The oven temperature was held at 60°C for 1 min then raised at a rate 10°C/min to 270°C. Sample aliquots (1 mcl) were injected in the splitless mode.

GC-HRMS isomer specific analyses were carried out with toluene extracts (2-5 ng 1,2,3,4-TCDD: m/z-319,897,321,894 and 50 ng /13/C6-1,2,3,4-TCDD: m/z-325,917,327,914 were added) pre-purified by LC on 10% and 40% sulfuric acid-impregnated silica gel columns and aluminium oxide columns, and by a r.p. HPLC (OV-17)

using a HS-Q 30 spectrometer, a Varian 3400 gas chromatograph, a 50 m x 0.25 mm SP 233I bonded phase quartz capillary column (2 min at 60°C, 20°C/min to I80°C, I min at I80°C, 2°C/min to 240°C), a double focusing, a Multi-Ion Selection mode, and data operational system SS 300. The necessary quality control procedures were performed.

Results of the GC-LRMS analysis showed that esterified 2,4-D and 2,4,5-T, di-, tri-, and tetrachlorophenols, trichloroanizoles, dichloromethoxy benzenes and phenols as well as certain chloroalcylphenols- and 2,4-D, 2,4,5-T-originated dimers are the main chlorinoorganic constituents of soil from an Agent Orange storing place. I,3,6,8-, I,3,7,9-, I,3,7,8-, I,2,3,4-, and 2,3,7,8-TCDDs(0,2-I8,9 ppb), I,3,6,7-, I,2,4,8/I,3,4,6-, I,4,7,8/I,3,6,9-, I,4,6,7/2,4,6,8-, I,2,7,8-, 2,3,6,8-, 2,4,6,7-, 2,3,4,7-2,3,7,8/3,4,6,7-TCDFs (0.4-2.6 ppb), 5 PeCDDs(0.I-0.3 ppb), I3 PeCDFs (0.2-0.6 ppb), 6 HxCDDs (C.4-IO.4 ppb), 8 HxCDFs (0.3I-2.22 ppb), 2 HpCDDs (2.7-5.4 ppb), and 4 HpCDFs (0.4-IO.4 ppb) isomers were resolved by GC-HRMS in these samples. Water samples collected in the lake on airport territory were relatively free from PCDD/PCDF isomers.

Further, soil and water samples were withdrawn from a I5-40 cm deep layers, small lakes, and a reservoir Tri An in the native and herbicides-treated regions of the provinces Dong Nai, Tay Ninh, Quang Tri, and in Ho Chi Minh City on the basis of ecological observations and cartographic ("HERBS Tape") information. This investigation is under preparation.

The obtained results demonstrated efficacy of the employed analutical methods and identified relatively high levels of toxic PCDD/PCDF congeners, including 2,3,7,8-substituted TCDD/TCDF, in contaminated soil particles from the Agent Orange storing place.