

# LONG-TERM MONITORING AMBIENT AIR PCDD/Fs IN AN INDUSTRIAL AREA

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## Introduction(Aim of study)

Dioxins are composed of polychlorinated dibenzo-*p*-dioxins(PCDDs) and dibenzofurans(PCDFs), which earmarked by the Stockholm Convention as Persistent Organic Pollutants (POPs)<sup>1</sup>. Due to the acute toxicity and associated adverse health effects, they have been extensively studied in literature<sup>2,3</sup>. PCDD/Fs emitted from various anthropogenic processes (such as waste incinerators, steel industries with electric and sintering furnaces, nonferrous metal industry facilities, etc...) in Hsiao-kang industrial district are released into the atmosphere and then transported over distances before settlement. Therefore, the monitoring of the PCDD/Fs levels in the vicinity of the industrial area has become an important issue. The aim of this study is to track and assess the concentrations and profiles of PCDD/Fs in the industrial area.

## Material and Methods

Hsiao-kang industrial district is located in the south of the Kaohsiung city, Taiwan. During the year of 2007 to 2014, 304 ambient air samples were collected around the area of Hsiao-kang industrial district. The sampling procedure was performed following the guidelines of the US-EPA method TO-9A. All sample collections were done with high-volume samplers, continuously working for 72 hours. Glass fiber filters and polyurethane foam (PUF) materials were used to absorb particle-bound and gaseous chemicals, respectively. Filter and PUF samples were combined and extracted with toluene in a Soxhlet apparatus. Before extraction, samples with known amounts of <sup>13</sup>C-labelled solutions (CIL, Inc., Andover, MA, USA) were spiked and used as internal standards. The extracts were cleaned up by using sulphuric acid, multi-layer silica gel, and activated carbon. After volume reduction and addition of recovery standards, samples were analyzed by HRGC-HRMS (Hewlett Packard-Agilent 6890 Series GC coupled with Waters AutoSpec Premier), equipped with a 60 m DB-5MS capillary column (0.25 mm I.D., 0.25 μm; Agilent Technologies).

## Results and Discussion

This study presented temporal trends in the period of 2007 to 2014. PCDD/Fs concentrations in ambient air of Hsiao-kang industrial district ranged from 0.019 to 0.166 pg I-TEQ/Nm<sup>3</sup> with an average of 0.070 pg I-TEQ/Nm<sup>3</sup>, which were lower than the ambient air standard of 0.6 pg I-TEQ/Nm<sup>3</sup> proposed by Japan Ministry of the Environment<sup>4</sup>. Annually average PCDD/Fs concentrations were 0.076, 0.080, 0.087, 0.073, 0.068, 0.051, 0.058, 0.043 I-TEQ/Nm<sup>3</sup>. A declining trend was observed over the monitored period (average decline of 7% per year). The average concentrations of PCDD/Fs in winter were 2.1 times higher than in summer. Among the PCDD/Fs congeners, 2,3,4,7,8-PeCDF was the dominant contributor to total TEQ value, reaching 44.5% (33% to 49.1%). Moreover, 1,2,3,4,6,7,8-HpCDF (19.0%), OCDF (16.3%) and OCDD (14.4%) were the greatest contributors for the total concentrations. Among them, Hepta and Octa chlorinated PCDD/Fs contributed over 60% of the total concentration.

In summary, we collected air samples to investigate the concentrations, seasonal variations and profiles of PCDD/Fs around an industrial area at Kaohsiung city, Taiwan. The air concentrations of PCDD/Fs declined year by year in this area. A clear seasonal trend of PCDD/Fs was observed, with higher concentrations in winter and lower levels in summer. The toxic dominant contributor congener was 2,3,4,7,8-PeCDF.

## References:

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