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CHARACTERISTICS OF PCDD/FS IN CLASSICAL FOOD AND FEED IN CHINA

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Introduction

Dioxins are a group of toxic and environmentally persistent compounds. They are formed as unwanted by-products in many industrial process, products usage and disposal processes1.The lipophilic properties of dioxins made them accumulate in body, especially in fat, both in animals and humans and biomagnified through the food chain2.Around 95% of human exposure occurs through consumption of food, and the main sources are animal origin food. Dioxin levels in food and feed have recently be monitored in many countries3-6. There had occurred many food contamination incidents which were caused by contaminated feed and feed additives7-9.

China is facing growing environmental pressure due to the rapid economic development and urbanization occurring over the last three decades. Although there are some studies on the level of dioxins, the results are more regional and determined few samples. The aim of this study was to evaluate the contamination level caused by PCDDs and PCDFs in different food and animal feed ingredients. 2841 samples including 9 varieties of food groups in total 845samples and 13 kinds of feed groups including 1996 samples were determine respectively by HRGC/HRMS according to US EPA method 1613,.

Materials and methods

Materials and regents. The solvents (acetone, n-hexane, dichloromethane, ethyl acetate, benzene, methanol, toluene for pesticide residue analysis) were purchased from J.T Baker, Co., Ltd. (USA). Calibration standard solutions, 13C12-labeled injection standards were purchased from Wellington Laboratories (Canada). Silica gel 60 (0.063–0.200 nm, AR grade) purchased from Merck (Darmstadt, Germany) and was activated at 500 °C for 6h before use.

Extraction, clean-up and analysis. All the other samples were extracted by Accelerated Solvent Extractor (ASE300, Dionex, USA) at 150"C and 1500 psi after spiking with internal standards. The extraction solvent was evaporated and roughly purified using acid-modified silica-gel, followed by the further purification using an automatic system (Power Prep, Fluid Management Systems, Waltham, MA, USA), which were comprised of multiple commercial silica-gel columns, basic alumina columns and carbon columns. PCDD/Fs fraction was separated and concentrated to approximately 25μL. 13C12-labeled injection standard was added before instrumental analysis10.

Results and discussion

Figure 1 showed the contribution of the 17 PCDD/F congeners to the total concentrations for food and feed. OCDD was definitely the predominant conger for foodstuffs and the average contribution was 39% to the total PCDD/Fs contents in all analyzed samples, followed by 1, 2, 3, 4, 6, 7, 8-HpCDF and 2, 3, 7, 8-TCDF, which accounted for 9% and 8% to the total PCDD/Fs concentrations, respectively. The results were largely in a good agreement with the previous studies in China5, 11, 12, and the differences were observed in some other reports, in which the main congeners were OCDD and 1, 2, 3, 4, 6, 7, 8-HpCDD 13-15. It presented that the main compounds of PCDD/Fs in food of China were different with Europe.

For all the detected feed groups, OCDD and OCDF were the predominant congeners of all groups except fish oils, binders and anti-caking agents, and together contributed 62% to the total PCDD/Fs content. These two congeners have also been pointed out as dominating ones in feed samples by other authors 16.

For all the detected groups, 1, 2, 3, 4, 7, 8-HxCDD, 1, 2, 3, 6, 7, 8-HxCDD, 1, 2, 3, 7, 8, 9-HxCDD, 1, 2, 3, 7, 8-PeCDD and 2, 3, 7, 8-TCDD were low frequency detection PCDD isomers and the total contribution to the sum of the PCDD/Fs of each group was less than 6%.

As can be seen in this study, OCDD was the most abundant congener in food and feed. It has also been reported that dominated in the environment samples such as atmospheric air, soil, sediments, and combustional emission17. Since WHO has change its TEF values from 0.0001 to 0.0003, its widespread presence and high abundance was worth of our attention.

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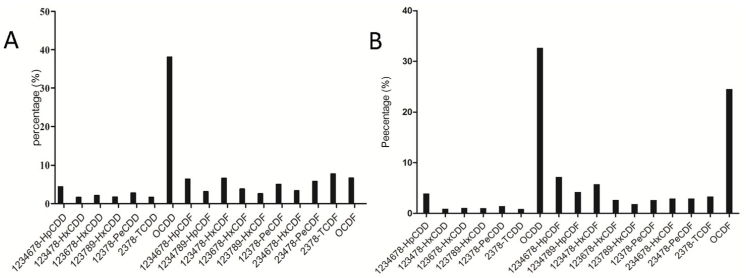

Figure 1 Percentage of relative contribution of the 17 congeners to the total concentration for food

(A) and feed (B).