LEVELS OF POLYCHLORINATED DIBENZO(p)DIOXINS, DIBENZOFURANS AND DIOXIN-LIKE PCBs IN IRISH COW'S MILK

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Introduction

To assess the presence of Polychlorinated Dibenzo(p)dioxins (PCDDs) and Dibenzofurans (PCDFs) in the Irish environment, the Environmental Protection Agency (EPA) of Ireland conducted a study on the levels of PCDD/Fs in cow's milk in 1995[1]. It was found that I-TEQs in Irish cow's milk samples from so-called background stations were lower than e.g. in other European countries. The range of lipid based levels was between 0.14 to 0,50 pg I-TEQ/g milk fat (20 samples). A set of 10 further cow's milk samples from so-called potential impact locations showed a nearly identical range of TEQs. The general absence of industry with the potential for forming dioxins as by-products was seen to be the main reason for the overall low dioxin levels in Irish cow's milk.

In 2000, the EPA of Ireland initiated a follow-up study with a similar design including this time the quantification of the 12 dioxin-like PCB congeners for which consensus TEFs were derived by a working group of the World Health Organization (WHO) in 1997[2]. The present study should indicate whether changes of PCDD/F levels in Irish cow's milk and thus the Irish environment took place in the last five years and give an indication of the PCB contribution to the TCDD TEQ.

Materials and Methods

Within the present study, a series of 24 raw milk samples was collected by the Irish EPA from so-called background stations throughout Ireland. The samples were taken in June and July 2000 from storage silos or tankers at representative regional Irish diaries[3]. Similar to 1995, a further set of 13 milk samples from so-called potential impact locations was included in the study. The milk samples were frozen in glass bottles and shipped to GfA without interrupting the cooling chain.

The cow's milk samples were analysed by GfA for PCDD/Fs and PCBs by means of fat extraction, gravimetrical determination of the fat fraction, chromatographic defatting of the fat extract, clean-up of the remaining fraction on different adsorbents, analysis of the purified extracts by means of capillary gas chromatography / high resolution mass spectrometry (HRGC/HRMS) and quantification via internal $^{13}C_{12}$-labelled standards (isotope dilution). The extract clean-up and the GC/MS analysis were carried out separately for the PCDD/F and the PCB analyses. Both analytical methods are routinely applied by GfA for the analysis of food or feeding stuff.

The dioxin/furan analyses covered the determination of the 17 PCDD/F congeners which have toxicity equivalency to 2,3,7,8-TCDD. Within the PCB analyses, the 12 dioxin-like PCB congeners for which toxic equivalency factors (TEFs) recently were revised by a working group of the WHO[2] were determined (PCBs IUPAC No. 77, 81, 105, 114, 118, 123, 126, 156, 157, 167,