COMMITTEE ON TOXICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

STATEMENT ON DIETARY EXPOSURE TO DIOXINS AND DIOXIN-LIKE PCBs

Introduction

1. We have been informed of the results of a study conducted by the former Joint Food Safety and Standards Group of the Ministry of Agriculture, Fisheries and Food and the Department of Health in which Total Diet Study (TDS) samples collected in 1997 were analysed for the presence of polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), collectively referred to as dioxins, and polychlorinated biphenyls (PCBs).[1]

Tolerable Daily Intake

2. In 1992 we endorsed a Tolerable Daily Intake (TDI) for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) of 10 picograms/kilogram body weight (10 pg/kg b.w.) that had been recommended by the World Health Organization (WHO) Regional Office for Europe. We also recommended that when considering mixtures of dioxins the TDI could be regarded as being expressed in Toxic Equivalents of TCDD (TEQs), calculated using internationally agreed Toxic Equivalency Factors (TEFs) for dioxin congeners, i.e. 10 pg TEQ/kg b.w.[2]

3. In our 1997 review of the health hazards of PCBs, we were unable to set a TDI for total PCBs. However, we considered that the use of TEFs for certain dioxin-like PCB congeners offered a pragmatic approach to assess the potential toxicity of these dioxin-like PCBs and that they should be considered in combination with dioxins.[3]

4. Recently, we have endorsed the TEFs recommended by a WHO European Centre for Environment and Health (ECEH) consultation for the seventeen 2,3,7,8-substituted dioxin congeners and twelve dioxin-like PCB congeners.[4, 5]

5. We are aware that a recent WHO International Program for Chemical Safety (IPCS)/ECEH consultation has recommended a TDI range for dioxins and dioxin-like PCBs of 1-4 pg TEQ/kg b.w.[6] We have not yet had the opportunity to review the data used by the consultation to derive the recently recommended WHO-TDI. We will undertake such a review when a full report of the consultation is available. In the interim we have considered the results

of the 1997 TDS survey using both the current UK-TDI and the recently recommended WHO-TDI.

Estimated dietary exposure to dioxins and dioxin-like PCBs

6. We have been provided with estimates of dietary exposure to dioxins and dioxin-like PCBs of adults, schoolchildren and toddlers i.e. children aged 1½ to 4½. The same methodology has been used to estimate dietary exposures from the 1997 TDS as was used to estimate exposures for these age groups from the 1982 and 1992 TDS.[1] We *note* that where concentrations of these compounds in food were below the limit of detection, the concentration has been assumed to be at the limit of detection. It is considered that this approach overestimates dietary exposures to dioxins and dioxin-like PCBs. We have been informed that dietary exposure of adults and schoolchildren has been estimated using food consumption data for these specific groups.[7, 8]

7. While food consumption data for toddlers do exist,[9] due to a current limitation in the methodology used to estimate exposures, the consumption of 'toddler-specific' foods cannot yet be determined. As a result, toddler food consumption data were not used directly to estimate toddler dietary exposures from previous Total Diet Studies.[10] Toddler dietary exposure has been estimated previously by scaling the estimated dietary exposure of adults by the relative energy contents of adult and toddler diet. The energy content of the latter was calculated from the toddler food consumption data.[9] For comparative purposes, this approach has also been used to estimate dietary exposure of toddlers from the 1997 TDS.[1] However, toddler exposures have now also been estimated from the 1997 TDS (and retrospectively from the 1982 and 1992 TDS for comparative purposes) directly using toddler food consumption data. We *note* that this approach does not take into account exposures resulting from the consumption of 'toddler-specific' foods but we *consider* that it provides a more robust estimate of toddlers' dietary exposure than the earlier approach. However, we *recommend* that the methodology is revised as soon as possible so as to take account of consumption of 'toddler-specific' foods and we *ask* to see these revised exposure estimates at the earliest opportunity.

8. Dietary exposure to dioxins and dioxin-like PCBs, estimated from the 1982, 1992, and 1997 Total Diet Studies, for average and high-level (97.5th percentile) adult, schoolchild, and toddler consumers (using both approaches) are presented in the Table. The Table presents toddler dietary exposures estimated from toddler food consumption data and also presents exposures estimated by scaling adult consumption patterns by the energy content of the toddler diet. Dietary exposures estimated using toddler food consumption data are higher than when estimated by scaling adult consumption patterns by the energy content of the toddler diet. Exposures estimated from the 1982 and 1992 TDS have been recalculated using the new WHO-TEFs so that the data are comparable to dietary exposures estimated from the 1997 TDS.

Table: Estimated dietary exposures to dioxins and dioxin-like PCB from TDS samples (pg TEQ/kg b.w. per day)

Year	1982		1992		1997	
Consumer type	**Average**	**High-level**	**Average**	**High-level**	**Average**	**High-level**
Age-group						
Adults	7.2	13	2.5	4.3	1.8	3.1
Schoolchildren	8.6	15	3.0	4.7	2.2	3.5
Toddlers (estimated using toddler food consumption data)						
1½ to 2½	23	49	7.5	14	5.1	10
2½ to 3½	19	41	6.3	11	4.4	8.4
3½ to 4½ (boys)	17	33	5.6	9.2	4.0	6.9
3½ to 4½ (girls)	17	34	5.6	9.6	4.0	7.2
Toddlers (estimated by scaling adult consumption patterns by the energy content of the toddler diet)						
1½ to 2½	18	28	6.3	9.8	4.6	7.2
2½ to 3½	17	25	5.8	8.6	4.2	6.3
3½ to 4½ (boys)	16	23	5.7	8.0	4.1	5.8
3½ to 4½ (girls)	15	23	5.3	8.0	3.9	5.8

9. The estimated dietary exposures to dioxins and dioxin-like PCBs for both average and high-level consumers from the three age groups are at or within the current UK-TDI of 10 pg TEQ/kg b.w. Furthermore, the estimated average and high level dietary exposures for adult and schoolchild consumers are also below the upper value of the recently recommended WHO-TDI of 1-4 pg TEQ/kg b.w. However, the estimated dietary exposures for toddlers who are average consumers are at or slightly above the upper value of this TDI. The upper value of this TDI is exceeded approximately two-fold by all toddlers who are high-level consumers.

10. The estimated dietary exposures to dioxin-like compounds, on a total TEQ basis, for all three age groups show a continuing downward trend, albeit less steeply compared with the decline between 1982 and 1992. However, the dietary exposures to dioxin-like PCBs estimated from the 1997 TDS are very similar to those estimated from the 1992 TDS.

11. We have seen data which indicate that the decline in dietary exposure is real and not attributable to changes in analytical sensitivity or number of food groups analysed in different Total Diet Studies. This decline in dietary exposure is primarily due to either a reduction in emissions to the environment or a change in food consumption patterns, or both.

Environmental controls

12. Abatement measures have been taken to control the emission of dioxins to the environment and hence foods. In particular the imposition of strict emission limits on municipal waste incinerators have reduced emissions from this sector by an estimated 90%. The UK is introducing Regulations to

give effect to EC Directive 96/59, which requires the phasing out and disposal of remaining identifiable PCBs. The Regulations follow on from consultation last year, and the publication of the UK action plan in 1997.[11] It is anticipated that as a result of these measures dietary exposure to dioxins and dioxin-like PCBs will continue to decline gradually. We understand that the Government is in the process of producing an UK position paper on dioxins and dioxin-like PCBs, which will assess the effectiveness of current and future abatement measures.

Recommendations

13. We are *reassured* by the evidence of a continuing decline in dietary exposure to dioxin-like compounds. We *welcome* the evidence that average and high-level adult and schoolchild consumers do not exceed the current UK-TDI or the upper value of the recently recommended WHO-TDI.

14. We *note* that estimated dietary exposures of toddlers do not exceed the current UK-TDI but that approximately 50% of toddlers will exceed the upper value of the newly recommended WHO-TDI. However, we *note* that there are limitations in the methodology used to derive these estimated exposures for toddlers, which means that such estimates should be viewed with caution. We *recommend* that robust characterisation and estimates of toddler exposure, taking into account consumption of 'toddler-specific' foods, are carried out and we *request* that we see such information at the earliest opportunity.

15. We *note* that the WHO-IPCS/ECEH consultation recommended that continued efforts should be made to reduce exposure towards the lower end of the newly recommended WHO-TDI range. We will undertake a review of the WHO-TDI when a full report of the consultation is available and we will pay particular attention to the relevance of the WHO-TDI to toddlers.

16. We *recommend* that dietary exposure to dioxin-like compounds should continue to be monitored at regular intervals to confirm that the overall downward trend in exposure continues as a result of current and future abatement measures.

17. The available data indicate that some 50% of toddlers in the UK will exceed the upper value of the WHO-TDI but not the current UK-TDI. However, we do not consider that this exceedence necessarily poses a health risk and, in advance of a detailed review of the WHO-TDI, we do not recommend any intervention with respect to the diets of toddlers. This interim position is based upon the following considerations:

i) it is not yet clear to what extent the WHO-TDI is particularly relevant for toddlers;
ii) evidence that some toddlers may exceed the WHO-TDI is based upon estimations of dietary exposure that need to be treated with some caution; and

iii) there is a continuing decline in the overall exposure to dioxin-like compounds.

Conclusions

18. Estimated exposures to dioxins and dioxin-like PCBs for adults, schoolchildren, and toddlers are all at or below the current UK-TDI. Estimated exposures for adults and schoolchildren are also below the upper value of the newly recommended WHO-TDI, although toddlers may exceed this value. However, estimated exposures for all age groups have substantially declined since 1982 and we anticipate that exposures will continue to decline in the future due to the environmental controls already in place and those planned. We conclude that the current concentrations of dioxins and dioxin-like PCBs in food are unlikely to pose a risk to health.

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COT Statement 2000/03

References

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