Project for the re-evaluation of human and mammalian toxic equivalency factors (TEFs) of dioxins and dioxin-like compounds

BACKGROUND

During the last 15 years, WHO through the International Programme on Chemical Safety (IPCS) has established and regularly re-evaluated toxic equivalency factors (TEFs) for dioxins and related compounds through expert consultations. WHO-TEF values have been established for humans and mammals, birds and fish (Ahlborg et al 1990; Van den Berg et al 1998). These international consensus TEFs have been developed for application in risk management in various Member States and have been adopted formally by a number of countries and supranational bodies, including, amongst others, Canada, Japan, the United States and the European Union.

During the last assessment 1997 at the WHO/IPCS expert consultation in Stockholm, it was agreed to re-evaluate TEF values on a regular basis, preferably at five-year intervals. Such a re-evaluation should be based on new scientific information published in the peer reviewed literature subsequent to the last expert consultation.

WHO considers this re-evaluation of TEF values an important effort and has initiated a project to review the current human and mammalian TEFs. The project will serve to update the database summarizing all studies published on the relative potency of dioxins, furans, and dioxin-like PCBs. An expert workshop will consider all new data and review the current WHO-TEFs.

For more details, consult the project description on the right.

TEF review project

:: Project description (Oct 2004)

:: Public Session

:: Update (May 2005)

RESULTS

An expert workshop was held on 28 to 30 June 2005 at WHO Headquarters in Geneva. Preceding the workshop on 27 June, was a Public Session, to give interested parties an opportunity to express their views on the subjects to be addressed in the workshop and for follow-up activities.

During the workshop, the expert group developed and applied a systematic decision scheme to review existing TEFs, using the WHO 98 TEF values (Van den Berg et al., EHP 106, 1998) and the recently published updated database of relative potencies (Haws et al., ToxSci 89, 4-30, 2006) as a starting point. Previous decisions of the 1997 expert consultation were reviewed in light of new data and of the distribution of REP values. For each congener, the decision scheme was applied and the 2005 TEF value derived and expressed as half-log increments. The decision taken for each congener is described in detail which significantly increases the transparency of the TEF derivation and allows for easier refinement should new data become available.

As a result, a number of TEF values have been changed, notably for PCBs, octachlorinated congeners and pentachlorinated furans.

In addition the expert group commented in detail on the application of the TEF concept and the possible inclusion of new compounds into this concept. Recommendations are also given for future developments in this area.

The outcome of this expert consultation has now been accepted as peer-reviewed article in the journal Toxicological Sciences:

The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
Martin van den Berg, Linda S. Birnbaum, Michael Denison, Mike De Vito, William Farland, Mark Feeley, Heidelore Fiedler, Helen Hakansson, Annika Hanberg, Laurie Haws, Martin Rose, Stephen Safe, Dieter Schrenk, Chiharu Tohyama, Angelika Tritscher, Jouko Tuomisto, Mats Tysklind, Nigel Walker, and Richard E. Peterson

ToxSci Advance Access published **7 July 2006**.

The advance copy is accessible here.

The final conclusion regarding the TEF values is summarized in the table below.

WHO advises that the new WHO 2005 TEF values are used from now as they replace the previous 1998 values.

Compound	**WHO 1998 TEF**	**WHO 2005 TEF***
chlorinated dibenzo-p-dioxins		
2,3,7,8-TCDD	1	1
1,2,3,7,8-PeCDD	1	1
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01
OCDD	0.0001	**0.0003**
chlorinated dibenzofurans		
2,3,7,8-TCDF	0.1	0.1
1,2,3,7,8-PeCDF	0.05	**0.03**
2,3,4,7,8-PeCDF	0.5	**0.3**
1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1

1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
OCDF	0.0001	**0.0003**
non-ortho substituted PCBs		
PCB 77	0.0001	0.0001
PCB 81	0.0001	**0.0003**
PCB 126	0.1	0.1
PCB 169	0.01	**0.03**
mono-ortho substituted PCBs		
105	0.0001	**0.00003**
114	0.0005	**0.00003**
118	0.0001	**0.00003**
123	0.0001	**0.00003**
156	0.0005	**0.00003**
157	0.0005	**0.00003**
167	0.00001	**0.00003**
189	0.0001	**0.00003**

Numbers in bold indicate a change in TEF value.

A PDF version of the above table is available below.

:: TEF values [pdf 31kb]