

Human health implications of measurable dioxins and dioxin-like compounds in human milk

Dept of Food Safety and Zoonoses (FOS)

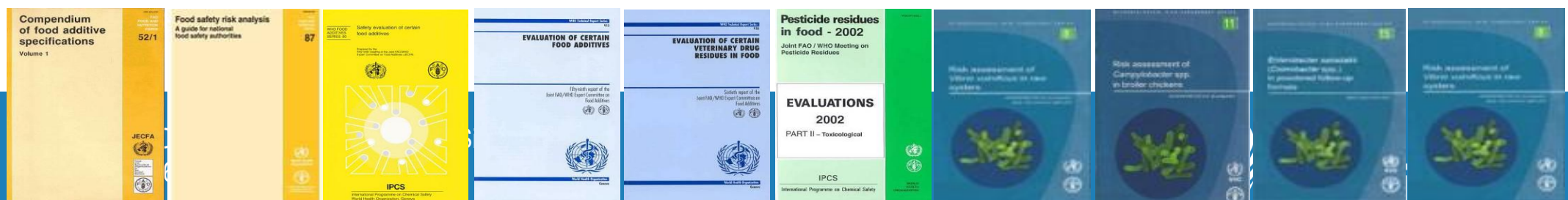
<http://www.who.int/foodsafety/en/>



Joint FAO/WHO Expert Committee on Food Additives (JECFA)

- JECFA, an updated comprehensive risk assessment of PCDDs, PCDFs, and dioxin-like PCBs in 2001.
- A provisional tolerable monthly intake (PTMI) of 70 picogram/kg per month was established due to their long half-lives and cumulative properties.
- Fifty-seventh report of the JECFA (WHO Technical Report Series, No. 909, 2002).

<http://www.who.int/foodsafety/publications/jecfa-reports/en/>



Risk for human health

- End-point; Reduced ventral prostate weight; decreased anogenital distance in male offspring; decreased sperm production and altered sexual behaviour in male offspring.
- Mainly adverse effects on the reproductive system are induced in male offspring of pregnant rats given TCDD
- The NOEL body burden (13 ng/kg bw) and LOEL body burden (25ng/kg bw) were identified for the most sensitive adverse effects of TCDD on developmental end points in rats.
- The LOEL and NOEL were provided by the studies of Faqi et al (1998) and Ohsako et al (2001).

Breastfed infants

- Adverse effects can occur in babies from mother with high body-burden
- Breastfed infants have higher intakes of these compounds than bottle-fed infants or adults on a body-weight basis
- Uptake of dioxin TEQs via breastfeeding reported in a range of 30 to more than 200 pg TEQs/kg bw per day.
- The results of the human milk survey reported in previous slides are in line with these estimates.



Benefits of breast feeding for the infant

Based on extensive recent reviews:

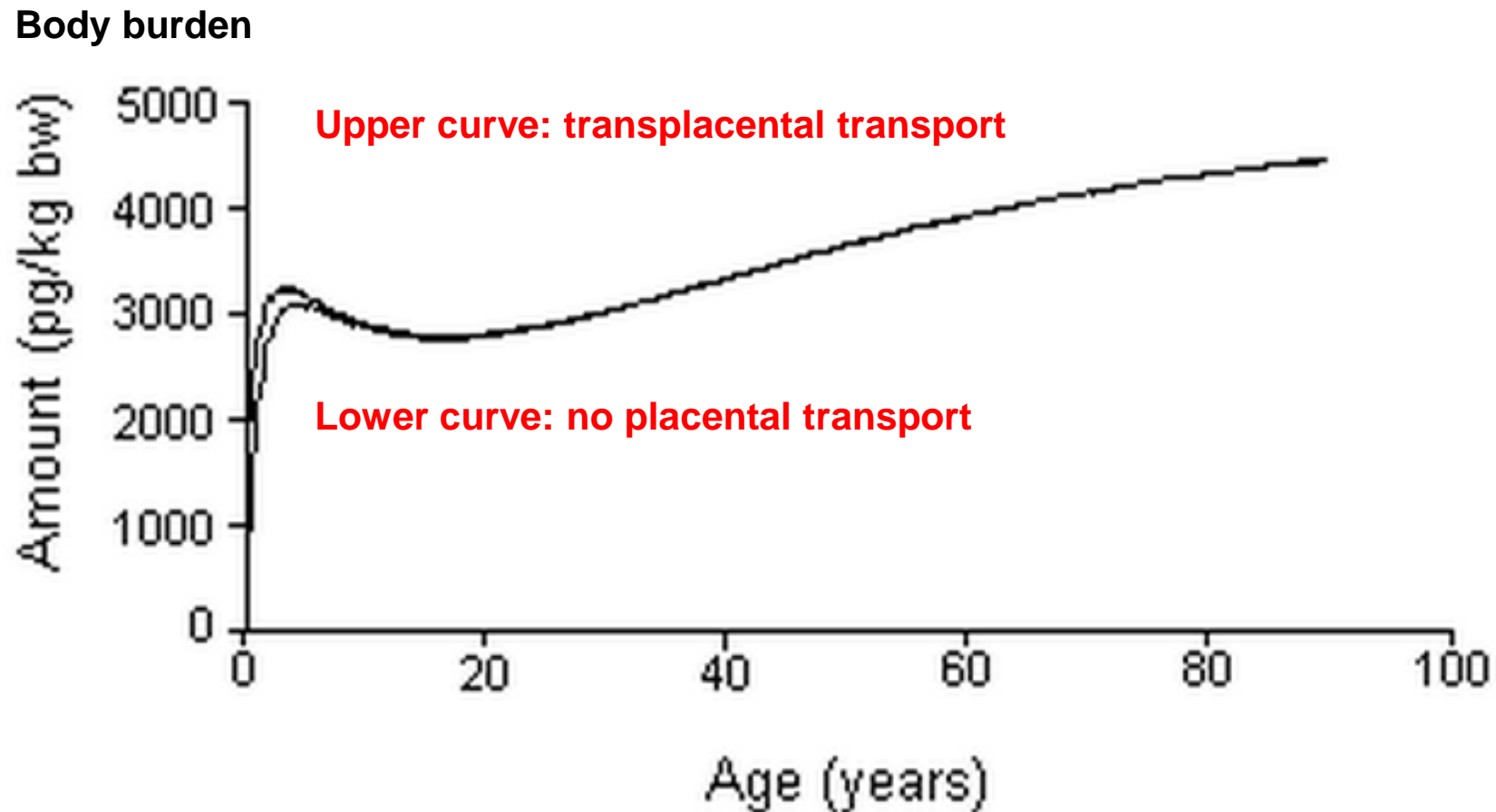
- Breastfeeding : decrease in overall postneonatal death
- Reduced risk of otitis, gastroenteritis, lower respiratory tract infections, dermatitis, asthma, obesity, and others
- Compelling evidence for overall reduced morbidity and mortality



Linking external exposure with internal dose

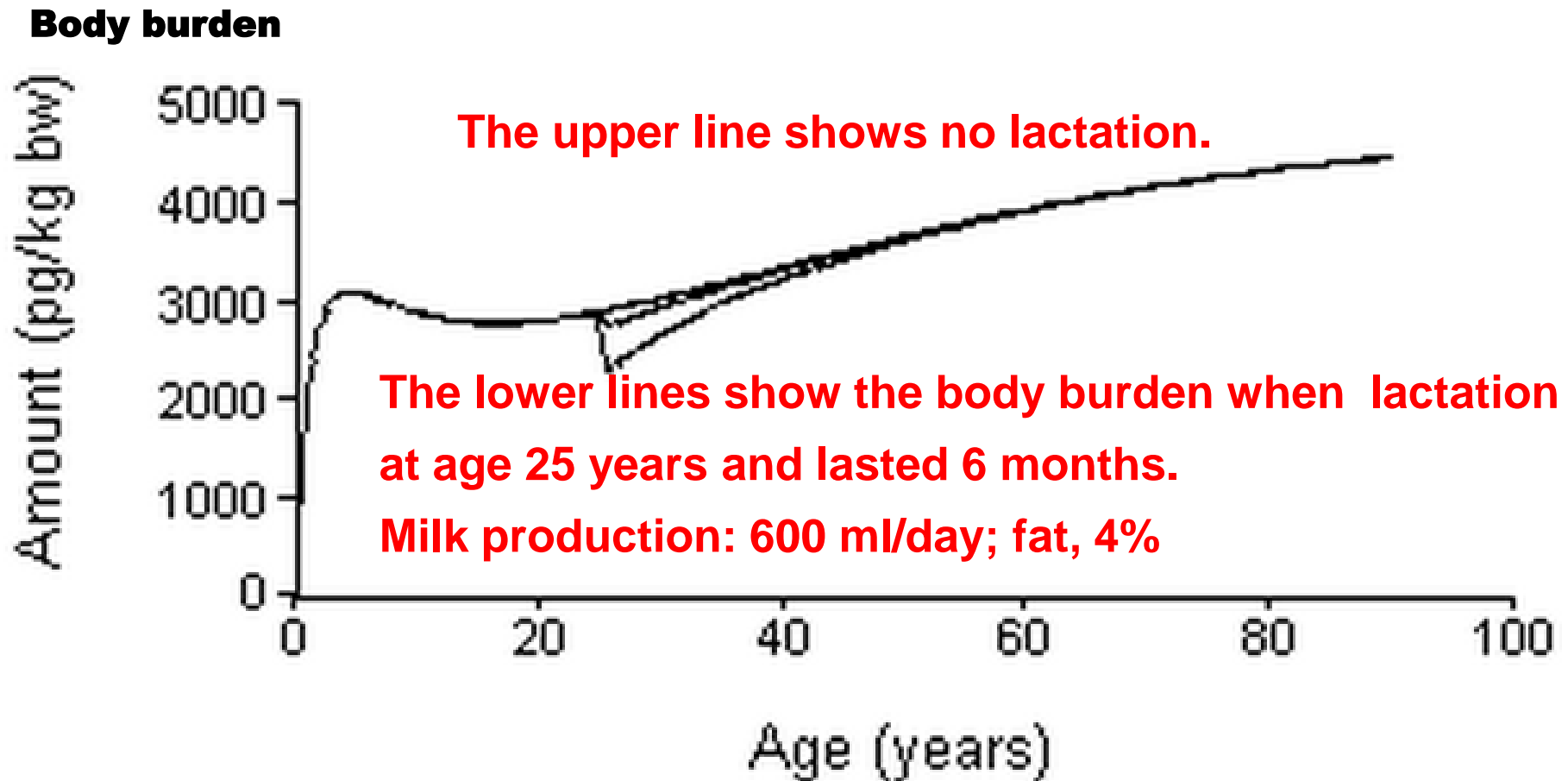
- Dioxins are eliminated very slowly by the organism after ingestion (the estimated half-life of TCDD is 7.6 years)
- The critical adverse effects are resulting from the accumulation of dioxins and it is therefore essential to estimate the body burden at steady-state
- **Physiologically based pharmacokinetics modelling** has been used to describe the kinetics of dioxins in humans.
- Following figures show typical simulations made with such model of the accumulation of TCDD in the human body as expected after a variety of exposure scenarios.

Effect of transplacental exposure on the body burden after life-long exposure to TCDD



Source : WHO Food additives series 48 p 470
(originally Model as in Zeilmaker & Eijkeren (1998))

Effect of lactation on body burden of mother



Source : WHO Food additives series 48 p 470
(originally Model as in Zeilmaier & Eijkeren (1998))

One of implications for the period of intake

- Due to this long-term storage in the body, intake on a particular day will have a small or even negligible effect on the overall body burden.
- For example, in the unlikely event of food contamination that leads to an intake 100 times the amount present in a typical meal, the body burden of the adult eating that meal would increase by <3%.
- The rest of the body burden would be made up of the dioxins consumed in many thousands of meals over the previous decade or more.

Conclusion

- The level of dioxin-like compounds in human milk is the consequence of the accumulation of these compound in the organism.
- The consumption of contaminated food during a short period of time does not affect significantly the body burden
- In order to reduce the body burden it's necessary to monitor the sources of dietary exposure
- It is then necessary to consider mathematical models to link external exposure with biomonitoring data.



Thank you for attention

