

**SUPPLEMENTARY REPORT  
ON THE HEALTH RISK (IMPACT) ASSESSMENT  
FOR  
THE PROPOSED ROSE ENERGY PLANT, COUNTY  
ANTRIM – CONSIDERATION OF DIOXINS IN BREAST  
MILK**

**BY**

**PROFESSOR JAMES BRIDGES**

Emeritus Professor of Toxicology and Environmental Health  
University of Surrey, Guildford, Surrey

**March 2009**

1. **Reason for this Supplementary Report**

Concerns have recently been expressed locally, regarding the possible impact of emissions from the proposed power plant on breast fed infants. I have produced this supplementary risk assessment to address this issue.

Two parallel approaches are used:

- a) Information derived from the published literature.
- b) Consideration of additional modelling data provided by the Airshed.

2. **a) Findings from the published literature**

i) Trends in levels of dioxins in food over time

As discussed in my main report, the predominant source of human exposure to dioxins is via the food, particularly oily/fatty foods. Typically the proportion of dioxins derived from food is >95%. Frequent evaluations of dioxin levels have been made by a variety of national and international bodies. The data shows that dioxin levels in food have been falling, over the past two decades, throughout the western world (eg. see DEFRA 2005, De Mul et al 2008).

3. Trends in dioxin levels in breast milk over time

Regardless of the source, both formula milk and breast milk contain trace amounts of dioxins. Levels of dioxins in breast milk are generally somewhat higher than those in formula milks (eg. Hsu et al 2007). Nonetheless public health authorities recognise that on balance there are overall considerable advantages in the breast feeding of infants (FSA, EFSA, COT, JECFA, USFDA).

4. In almost all developed countries, there has been a progressive reduction of dioxin levels in breast milk over the past two decades. This is not surprising as the levels in breast milk would be expected to reflect the levels of dioxins in the food consumed. Recent UK figures indicate levels of around 50pg TEQ/kg/day with a range between 27 and 73.8pg TEQ/kg/day (COT 2004).

5. The mother's diet prior to and during pregnancy is the dominant influence of the dioxin levels in her breast milk. This is reflected in the fact that the levels of dioxins in the placenta predict the levels in the breast milk (Wang et al 2004).
6. Other factors that affect the levels of dioxin in breast milk include the mother's age and her history of breast feeding (Guan et al 2005, Todaka et al 2008).
7. Estimation of any dioxin risk to children needs to consider exposure across childhood. Thus the dioxin levels in the food consumed by a child, post breast feeding, will be the primary source of exposure. The study of Leung et al (2006) who measured the half lives of dioxins in two breast fed infants is of interest. They found that the average half lives, for different congeners, ranged from 0.27-0.46 of a year. These half lives are much shorter than those determined for adults (7-15 years). The authors attributed the relatively short half lives to the rapid growth of adipose tissue and the enhanced faecal excretion of dioxins in infants.
8. The relationship between living in proximity to an incinerator and dioxin levels in breast milk  
A conservative estimation of the contribution of emissions from an energy plant, (such as the proposed power plant) to the dioxin levels in the breast milk of nursing mothers can be derived from a study of the literature relating to old and new incinerators. A number of authors, in various countries, have compared the levels of dioxins in breast milk in communities living around incinerators with control populations (i.e. similar populations but not living near an incinerator).
9. Demi *et al*, (1996) studied individuals living around an old, poorly performing, municipal solid waste incinerator in Germany that had been in operation since 1983. No significant differences were found in the breast milk levels in these two populations.
10. Yoshida *et al* (2000) observed the, at first surprising, finding of a trend to lower levels of dioxins in lipids and milk lipids in the residents around a waste to energy plant than the average for the general population. Measurements showed a wide range of values. This indicated that all

residents, including those living around the incinerator, must have been exposed to other much more important sources of food contamination by dioxins.

11. Schumacher et al (2004) measured levels of dioxins in breast milk, before and three years after, the commissioning of a waste to energy plant. They noted a 34.2% reduction in the breast milk dioxin levels in the local community since the plant began operation. The authors concluded that living in proximity to the plant had no impact on breast milk levels of dioxins.
12. Two studies in Portugal assessed the impact of dioxins emitted from incinerators on human health. Both found no increase in breast milk in the local population compared to a control population (Reis *et al* 2007a, 2007b).
13. *It can be concluded* that modern plants, such as the proposed power plant, are most unlikely to produce a significant increase in the levels of dioxins in the breast milk of nursing mother's in the local community.
14. **b) Consideration of additional modelling data**

Conclusions from my previous report

As discussed above, the levels of dioxins in breast milk, over time, reflect the levels of dioxins in the diet. The levels of dioxins in the diet of residents, as calculated by the Airshed were used in my previous report to assess possible risk to the local community. These values were compared with the standards set by WHO (JECFA) for dioxins of 0.001-0.004ng/kg body weight. For the adult resident a very large safety factor (79365) was calculated.

15. Results of additional modelling

Additional modelling data has now been provided by the Airshed and analysed by IOM. The results from the modelling, estimate that a nursing mother on a farm close to the proposed power plant, and eating a substantial proportion of her food from the farm, could as a worst case estimate, have 2.94pg TEQ/kg/day in her breast milk due to the operation of the power plant. Bearing in mind that this is a worst case estimate, it is a very small amount of dioxin, both in absolute terms and when compared with the UK average of 50pg/kg/day.

16. **c) Overall Conclusions**

The results from the conservative modelling of the levels of dioxins in breast milk are entirely compatible with the findings from the published literature. They indicate that the potential contamination of the diet and hence the breast milk, due to the operation of the proposed power plant, will be extremely low. It is therefore most unlikely to result in any increased health risk to local breast fed infants.

## References

DEFRA (2005) *Notes of the dioxin strategy Group 1<sup>st</sup> December 2005*, London, UK

Deml E, Mangelsdorf I and Greim H (1996) '*Chlorinated dibenzodioxins and dibenzofurans (PCDD/F) in blood and human milk of non-occupationally exposed persons living in the vicinity of municipal waste incinerator* Chemosphere, **33**:1941-1950

De Mul A, Bakker MI, Marco J et al (2008) *Dietary exposure to dioxins and dioxin like PCB's in the Netherlands anno 2004* Regulat Toxicol Pharmacol. **51**, 278-287

Guan P, Tajima M, Uehara R, Watanabe M, Oki I, Ojima T and Nakamura Y (2005) *association between dietary intake and breast milk dioxin levels in Tokyo, Japan* Paediatrics International **47**, 560-566

Hsu JF, Guo YL, Liu CH, Hu, SC, Wang JN and Lia PC (2007) *A comparison of PCDD/PCDF's exposure in infants via formula milk or breast feeding* Chemosphere **66**, 311-319

Leung HW, Kerger B and Paustenbach D (2006) *Elimination half lives of selected polychlorinated dibenzodioxins and dibenzofurans in breast fed human infants* J Toxicol ENV Health **69**, 437-443

Reis MF, Miguel JP, Sampaio C, Aguiar P, Melim JM, Papke O (2007a) '*Biomonitoring of PCDD/Fs in populations living near portuguese solid waste incinerators: Levels in human milk*' Chemosphere **67**: S231- 237

Reis MF, Miguel JP, Sampaio C, Aguiar P, Melim JM, Papke O (2007b) '*Determinants of dioxins and furans in blood of non-occupationally exposed populations living near portuguese solid waste incinerators*' Chemosphere **67**: S224- 230

Schuhmacher JL, Domingo JL, Kiviranta H and Vartiainen T (2004) *Monitoring dioxins and furans in a population living near a hazardous waste incinerator: levels in breast milk* Chemosphere 57, 43-49

Todaka T, Hirakawa H, Kajiwara J et al (2008) *Concentrations of polychlorinated dibenzo-p-dioxins polychlorinated dibenzofurans and dioxin like polychlorinated biphenyls in blood and breast milk collected from 60 mothers in Sapporo City, Japan, Chemosphere* **72**, 1152-1158

Wang SL, Lin CY, Leon G, Yueliang L, Long-Yau C, Wei-Ling C and Louis W (2004) *Infant exposure to polychlorinated dibenzo-p-dioxins, dibenzofurans and biphenyls- correlation between prenatal and postnatal exposure Chemosphere* **54**, 1459-1473

Yoshida K, Ikeda S, Nakanishi J (2000)'Assessment of human health risk of dioxins in Japan '*Chemosphere*' **40**:177-185