

DECREASED LUNG FUNCTION FOUND TO BE ASSOCIATED WITH PERINATAL EXPOSURE TO DUTCH BACKGROUND LEVELS OF DIOXINS

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Introduction

Perinatal exposure to Dutch "background" dioxin levels is rather high [1, 2]. Studies of calamities have shown that dioxins negatively influence the respiratory system [3]. We hypothesised that perinatal exposure to background dioxin levels would lead to lung sub-optimality, probably through developmental interference.

In order to test our hypothesis we strove to assess lung function in relation to perinatal dioxin exposure amongst our longitudinal cohort.

Subjects, Methods and Materials

Spirometry was performed in 41 healthy children (aged 7 - 12 years, mean 8.2 years) with known perinatal dioxin exposure. The children were prenatally recruited and have regularly been studied and reported on during the past up to 12 years. The FEV₁/FVC ratio was determined. This is a sensitive and widely used method of determining lung function. A complete medical history was taken.

Results

The prenatal exposure ranged from 8.74 to 88.8 (mean 34.6) ng TEQ dioxin/kg fat, measured in breastmilk. The postnatal exposure ranged from 4.34 to 384.51 (mean 75.4) ng TEQ dioxin. Six

children reported using respiratory system-influencing medication, such as salbutamol and corticosteroids. They were excluded from analysis because of the obvious confounding effects of the medication. Six children failed to produce reliable spirometry measurements (as judged according to the European Respiratory Society requirements for reliable spirometry) and were excluded from analysis.

A significant decrease in lung function in relation to both prenatal ($p=0.045$) and postnatal ($p=0.0002$) dioxin exposure was seen in the 29 non-excluded children. A clinical association between chest congestion and perinatal dioxin exposure was seen.

Conclusion

This study provides evidence that perinatal background dioxin exposure may be inversely associated with FEV₁/FVC ratio. These results point to respiratory sub-optimality as a result of perinatal dioxin exposure. We would hypothesise developmental interference by dioxin exposure as being the cause of the sub-optimality.

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References

1. van den Berg M, van der Wielen FWM, Olie K, van Boxtel CJ. The presence of PCDD's and PCDF's in human breastmilk from The Netherlands. *Chemosphere* 1986; 15: 693-706
2. Levels of PCB's, PCDD's and PCDF's in breast milk. Copenhagen: World Health Organisation 1989 (Environmental Health Series 34)
3. Pesatori AC, Zocchetti C, Guercijena S, Consonni D, Turrini D, Bertazzi PA. Dioxin exposure and non-malignant health effects: a mortality study. *Occup Environ Med* 1998; 55: 126-31

Figure 1: FEV₁/FVC ratio versus prenatal dioxin exposure. A best-fit line has been applied.

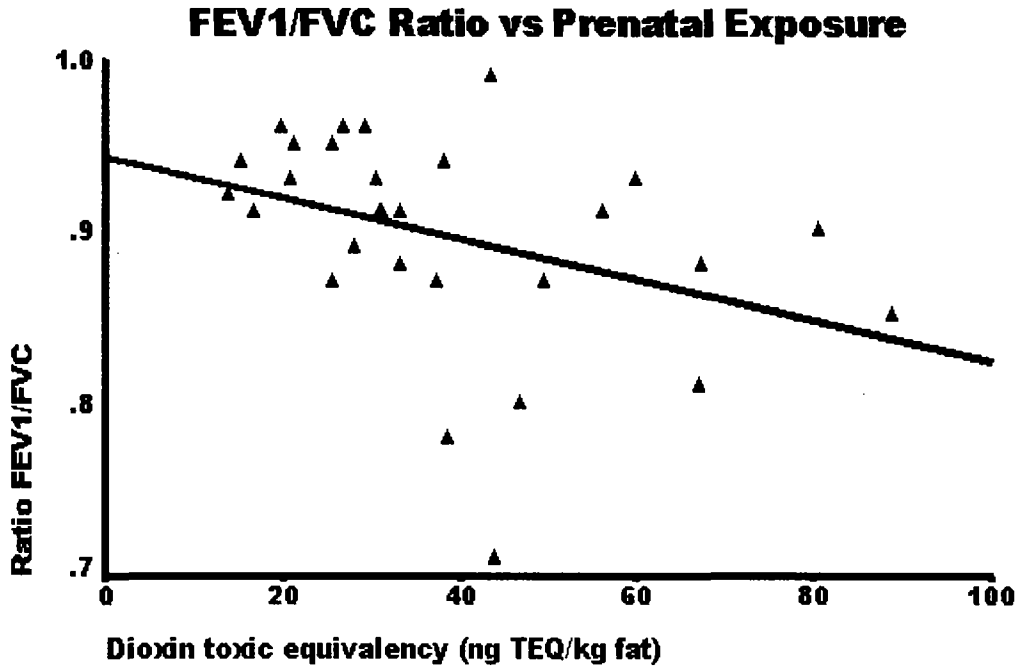


Figure 2: FEV₁/FVC ratio versus postnatal dioxin exposure. A best-fit line has been applied.

