HEXACHLOROBENZENE AND OTHER ORGANOCHLORINE COMPOUNDS INCORPORATION TO THE NEW-BORNS AND ITS EFFECTS ON NEONATAL NEUROLOGICAL DEVELOPMENT AT 6-8 WEEKS OF LIFE.

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Background and Objectives:
Organochlorine compounds like dichlorodiphenylthrichloroethane (p,p'DDT), polychlorinated biphenyls (PCBs), hexachlorocyclohexane (β,HCH) and hexachlorobenzene (HCB) are environmental pollutants. The main intake in humans is from diet and, exceptionally, by inhalation. New-borns are exposed to organochlorine compounds across the placenta and breast-feeding[1]. HCB is neurotoxic in laboratory animals[2]. Inhabitants of Flix, a rural village on the Ebro River (Tarragona, Spain), have the highest serum HCB levels ever found.[3] The aim of this study is to describe the internal dose levels of HCB and other organochlorine compounds (DDE, β-HCH and PCBs) in new-borns from Flix and nearby villages and to evaluate the effects of prenatal and postnatal HCB exposure on birth and on neurological development at three days, 6-8 weeks, 6-8 months and 12 months of life. We present here the results at three days and 6-8 weeks of life.

Methods:
All new-borns from mothers living in this highly contaminated village and in nearby villages, born from May 1997 up to the date when 100 cases have been obtained, will be followed up to one year. Levels of organochlorine compounds are measured by gas chromatography coupled to electron capture detection in maternal blood, maternal milk, cord blood and new-born capillary blood during the follow up. New-borns are examined with standardised neurological and neurodevelopmental tools (BNBAS at three days of life and Bayley, Griffith, Keeler Acuity Card and Wabletone at 6-8 weeks, 7-9 months and 12-15 months). Between May 1997 and February 1999 we examined 63 new-borns (67% of all births). In order to elucidate the effects of prenatal HCB exposure on the neurological development, the HCB levels median in cord blood (1.15 ng/ml) has been used to categorise the exposition in two groups: high (≥1.15 ng/ml) and low (<1.15 ng/ml).

Results:
Levels of HCB, β-HCH, p,p'DDE and PCBs were detected in the 100% of samples analysed of maternal blood, cord blood and new-born capillary blood at 6-8 weeks. The highest levels in all cases was for HCB, with a geometric mean of 2.87 ng/ml, 1.04 ng/ml and 1.91 ng/ml, respectively; followed by p,p'DDE, PCBs and β-HCH. No significant statistical differences were found between HCB levels in mothers and new-borns from Flix and from nearby villages. HCB and p,p'DDE levels in maternal blood correlated with levels in cord blood (R^2=0.50 and 0.63 respectively, $p<0.05$). HCB, p,p'DDE and PCBs levels were higher in new-born capillary blood at 6-8 weeks

than in cord blood ($p<0.05$). This increment was higher for HCB and PCBs in new-borns from Flix, while for p,p'DDE was higher in nearby villages. The increment in levels of these three compounds was higher in breast-fed new-borns.

Cord blood HCB levels were not associated with neither the weight, length, cranial perimeter and gestacional age nor the Brazelton Neonatal Behavioral Assessment Scale (NBAS) although the high exposure group presented a higher hipotonicity ($p=0.26$). After controlling for sex, mother's age, tobacco and alcohol consumption during pregnancy, the high exposure group scored lower than the low exposure group in all Bayley and Griffith areas. In the Bayley Scales the estimated difference between the performance of the two groups in the Mental Development Index was 2.1 ($p=0.72$) and 8 points ($p=0.17$) in the Motor Development Index. In the Griffith Scales, the difference was 13.2 ($p=0.03$) in the Locomotor area, 11.6 ($p=0.07$) in the Personal-social area, 7 ($p=0.11$) in the Hearing and language area, 6.9 ($p=0.2$) in the Eye-hand coordination area, 5 ($p=0.26$) in the Performance area and 10.4 ($p=0.03$) in the Total area.

Discussion:

All new-borns from Flix and nearby villages presented high levels of organochlorine compounds, principally of HCB. There was a correlation between HCB and p,p'DDE maternal blood levels and cord blood levels. These levels increased in the first weeks of life and this increase was higher for breast-fed new-borns. There was a significant statistical association between prenatal HCB exposure and the punctuation in the Locomotor area and in the Total area of the Griffith Scales. The overall score in both scales was lower in the high exposure group, which suggests that prenatal exposition to HCB may affect the neurological development.

References:

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