

10298- THE INTERPLAY BETWEEN BREASTFEEDING AND EXPOSURE TO ORGANOCHLORINE COMPOUNDS ON NEURODEVELOPMENT IN INFANTS

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OBJECTIVE: Exposure to organochlorine compounds (OCs) occur both pre- and postnatally. These periods are known to be critical windows of vulnerability for the nervous system. However, breastfeeding itself has been considered to be beneficial for the neurological development. Levels of hexachlorobenzene (HCB) in the cord serum of newborns from a population located in the vicinity of an electrochemical factory (Flix, Catalonia, Spain) are among the highest ever reported. We aim to study the interplay between breastfeeding and exposure to organochlorine compounds on neurodevelopment in the infants of this population.

METHODS: A birth cohort including biological samples was set up on 102 mother-infant pairs (89% of the eligible children born in the study area during the period 1997-1999). Ten mother-infant pairs were lost to the one-year follow-up. Organochlorine compounds in cord serum, child serum at 8 weeks of life and maternal colostrum were measured by gas chromatography coupled to electron capture detection. Duration of breastfeeding was categorised in formula-feed, short-term breastfeed (2-16 weeks) and long-term breastfeed (>16 weeks). Mental and psychomotor development was assessed at 12 months with the Bayley Scales of Infant Development.

RESULTS: At 8 weeks of life levels of organochlorine compounds in child serum were higher among those infants who had breastfed. Duration of breastfeeding was associated to a better performance in the mental scales. P,p'DDE and PCBs cord serum levels were negatively associated with both mental and psychomotor development (per each doubling of a dose of p,p'DDE there was a decrease of 3.7 (se=1.5) and 3.4 (se=1.4) points in the mental and psychomotor scales respectively; the decrease associated to PCBs was 3.53 (1.61) and 3.07 (1.50) respectively). Prenatal exposure to HCB had no effect on child neurodevelopment. Postnatal exposure through breast-milk and duration of breastfeeding were analysed in the same model. A negative effect of postnatal exposure on neurodevelopment was only observed among those infants who were short-term breastfed but the decrease was not statistically significant.

CONCLUSIONS: Although this population is highly exposed to HCB, only prenatal exposure to p,p'DDE and PCBs is associated to a delay in the mental and psychomotor development at the age of one year. Long-term breastfeeding is beneficial for the neurodevelopment of the child and balances the potential impact of the exposure to these chemicals through breast milk.

10350- Neurobehavioral performance and work experience in Florida farmworkers
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Farmworkers are exposed to many hazards, but little is known about the long-term health effects of their work. Working with a defined population in central Florida, we studied 283 farmworkers who had worked on one of three crops – ornamental ferns, nursery plants, or citrus fruit – and compared them to 51 unexposed controls. Information on months worked in each crop was collected using a structured questionnaire. Neurobehavioral performance was evaluated using a battery of seven tests adapted for use in Latino populations; some tests were implemented on a computer. Data were analyzed using logistic or linear regression, adjusted for potential confounders including age, sex, height, weight, education, acculturation, and alcohol use. Fern work was associated with worse performance for digit span, symbol digit, tapping, Santa Ana, and postural sway; nursery and citrus work were associated with worse performance for tapping and postural sway (Table 1). No changes in vibrotactile sensitivity or grip strength were related to farmwork. Deficits associated with farm work, when present, were comparable in size to those associated with less education or increased alcohol use. Dose-response for months of work was observed for fern work for tapping and Santa Ana; for nursery work for postural sway; and for citrus for tapping. We conclude that work with ferns, nursery plants, and citrus fruit may be associated with deficits in neurobehavioral performance reflecting cognitive, psychomotor, and integrated sensory-motor function.

Table 1. Work in specific types of agriculture and neurobehavioral performance. Arrows indicate direction of *worse* performance for each test. Results represent change in performance for ever work with crop compared to unexposed controls [odds ratios (90% confidence intervals) for digit span or slopes (90% confidence intervals) for other tests].

	Cognitive		Psychomotor		Sensory-Motor
	Digit Span ↑ (≤3 digits)	Symbol Digit ↑ (latency, msec)	Tapping ↓ (# taps)	Santa Ana ↓ (# pegs)	Postural Sway ↑ (length, cm)
Control	1.0	0	0	0	0
Fern	5.9 (1.0, 34)	194 (-38, 426)	-5.8 (-9.0, -2.7)	-1.0 (-1.8, -0.2)	6.3 (0.1, 13)
Nursery	3.6 (0.6, 21)	-1.5 (-220, 217)	-4.3 (-7.3, -1.3)	0.1 (-0.7, 0.9)	7.1 (0.9, 13)
Citrus	4.9 (0.8, 29)	21.6 (-201, 244)	-4.2 (-7.3, -1.2)	0.3 (-0.5, 1.1)	7.3 (1.2, 13)

10513- Continuing trend of increased motor neuron disease mortality in the United States

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Motor neuron disease (MND) is a neurodegenerative condition resulting in muscular weakness and wasting without attendant sensory changes. The most common form of MND is amyotrophic lateral sclerosis (ALS). Data from several countries indicate that MND/ALS incidence and mortality rates have increased steadily in recent decades. Although more common among men, the gap between MND/ALS rates among men and women may be decreasing over time. We evaluated multiple cause of death data (1989-98) to determine if these patterns were also evident in the United States. Previously reported MND mortality rates from the 1960s through the 1980s and the more recent data from the 1990s were age-adjusted to the year 2000 U.S. standard population. From 1989 through 1998, the crude MND mortality rate (95% confidence interval) was 1.71 per 100,000 population (1.70 - 1.73), a 138 percent increase over the crude rate from the 1960s. The age-adjusted MND mortality rate was 1.76 per 100,000 (1.71 - 1.81). The rate was higher for men, 2.18 per 100,000 (2.09 - 2.27), than for women, 1.45 per 100,000 (1.39 - 1.52). The highest mortality rates occurred in the over-65 year age groups. Compared to data from the 1960s, the overall age-adjusted MND mortality rate increased by 117 percent, reflecting a 108 percent increase for men and a 142 percent increase for women. When evaluating changes in MND mortality rates by age group, the greatest increases were observed in the older age groups. These findings are consistent with the trends in MND/ALS mortality observed worldwide. This rising U.S. MND mortality, particularly evident among women, may result from improved diagnostic accuracy associated with a changing ratio of the number of neurologists to the U.S. population, improved death certificate reporting, or changes in ICD coding. Alternatively, the overall trend and the greater relative increase among women may be indicative of changing exposures to environmental agents which may play a role in MND etiology.

10636- Neurobehavioral Health Status and Longer_Term Exposure to Hydrogen Sulfide: Findings for Dakota City, Nebraska 2002.

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Possible effects of hydrogen sulfide on neurobehavioral function were assessed with tests of cognitive, motor and sensory function, administered in English and Spanish. Hydrogen sulfide is a common pollutant from waste sites and certain industries. Further, potential health effects of chronic exposure to ambient levels are not well understood and, thus, pose a dilemma for public health officials. The study was conducted in Dakota City, Nebraska because ambient air measurements of hydrogen sulfide repeatedly had exceeded the state standard for sulfur compounds (100 ppb for a 30-minute rolling average) which have been associated with multiple emission sources of hydrogen sulfide in the area. Area-wide historical exposure to hydrogen sulfide was estimated from modeling air_monitoring data and used to identify exposed and non exposed areas. Study participants met the following requirements: age (>15 years), residence in specific geographic areas, and length of residence (≥ 2 years). Subjects were identified by a census and selected by random sampling. The study participation rate was 73% for the exposed group and 68% for the non exposed group. Of 345 persons recruited for the study, 175 were classified as exposed and 170 were classified as non exposed. Approximately 20% of participants had the tests administered in Spanish. Data from 15 neurobehavioral function tests and from the general health questionnaire were analyzed for differences between the exposed and unexposed groups while adjusting for confounders or subject variables. A summary of the analyses and results will be presented for both global and domain-specific neurobehavioral test results.

10771- Association between long-term exposure to pesticides and neurodegenerative diseases in a cohort of elderly in Bordeaux area (France)

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The steep increase in neurodegenerative disease incidence and prevalence in developed countries motivates research for elucidation of their etiology. Among environmental and occupational factors, pesticides represent a real concern as several studies found an association with Parkinson's disease and some with neurobehavioral disturbances.

The hypothesis that occupational exposure to pesticides could be related to central nervous disorders even after work cessation was investigated. Analyses were performed in a cohort of 1507 elderly living in Gironde (south-western France) among whom 320 (21.2 percent) were classified as exposed to pesticides according to a specific job exposure matrix (JEM). Exposure was also assessed by the report of a main job in agriculture and by the place of residence (in a rural district or in a district planted with vineyards). Mini Mental State Examination (MMSE) was used to assess cognitive functions. Diagnosis of Parkinson's Disease (PD) and Alzheimer's Disease (AD) resulted from the combination of questionnaires and the neurologist's examination. Lower performances at MMSE were observed in exposed subjects even when taking into account main confounders. The risk of PD and AD occurrence according to pesticide exposure was calculated between the 5th and 10th year of follow-up with delayed entry Cox proportional hazard models taking age, education and smoking into account, separately in men and in women. In men only, relative risks of developing AD and PD associated with JEM were 6.0 [1.7-21.3] and 3.4 [1.1-6.2] respectively. No association was found with main job in agriculture, nor with environmental pesticide exposure. Our results suggest that neurological impairments persist several years after pesticide exposure. Interestingly, these results were observed in an agriculture setting where organophosphates and carbamates contribute in a minor part to exposure.