

Cognitive Development in Yucheng children

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1. Introduction

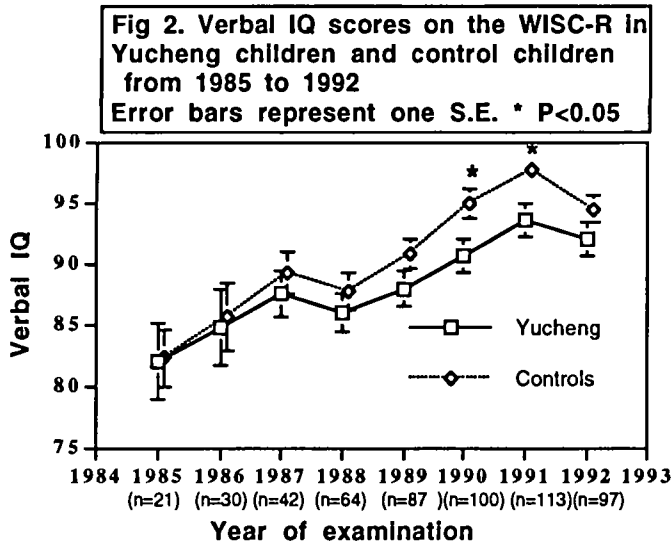
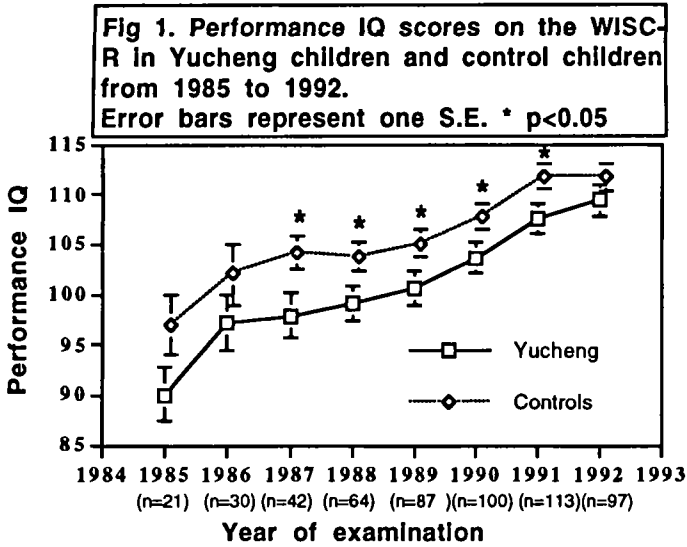
There were two episodes of systemic toxic exposure to polychlorinated biphenyls(PCBs) and its congeners. The first episode of mass poisoning occurred in Japan(called Yusho) in 1968¹). Another episode occurred in central Taiwan(called Yucheng) in 1978-9²). These events were traced to the contamination of rice bran cooking oil by PCBs and their thermally degraded compounds. The neurodevelopmental outcome of the Yucheng children has become a major concern as more studies from animals and human demonstrate long-term adverse effects of prenatal exposure to PCBs. The objective of this study was to test the hypothesis that Yucheng children with prenatal exposure to PCBs-PCQs-PCDFs will continue to have sustained adverse cognitive functioning.

2. Subjects and Methods

In early 1985, we identified all living children born to women in the PCB registry maintained by the health departments. These families were interviewed in their home, and 117 Yucheng children born to 69 mothers volunteered to participate in a physical examination and a long-term follow-up study. One matched control child was selected for each Yucheng child. The subjects were matched for neighbourhood, age(within 15 days for those under one year, and within one month for those older), sex, mothers' age(within 3 years), parents' combined educational level(within about 3 years for the total), and occupation(within 1 class of 5 classes from unskilled laborer to professional).

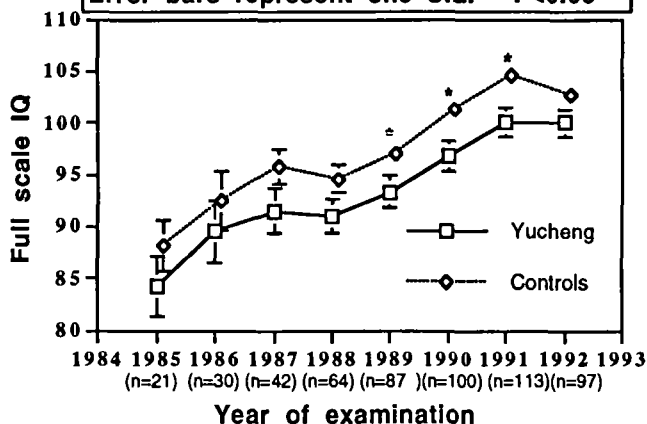
Measurement tools of cognitive assessments were (1) Bayley Scale of Infant Development(BSID) for those below 30 months of age, (2) Stanford Binet Intelligence Test for those aged from 30 months to 6 years old, (3) Wechsler Intelligence Scale for Children, Revised(WISC-R) for those 6 to 16 years old, (4) Raven's Colored Progressive Matrices(CPM) for those 5 to 9 years old, and (5) Raven's Standard Progressive Matrices(SPM) for those 9 to 15 years old. These were administered to all children at their homes in each appropriate year except BSID was done every 6 months.

3. Results



The mean age of Yucheng children and their controls on September 1, 1985 was 3.6 ± 2 years old. During the eighth-year follow-up study of WISC-R between Yucheng children and their matched controls, as we reported last year, Yucheng children scored lower in performance IQ (PIQ), verbal IQ (VIQ) and full scale IQ (FIQ) fig 1-3. However the differences were not significant at the eighth-year follow-up study.

Fig 3. Full scale IQ scores on the WISC-R in Yucheng children and control children from 1985 to 1992. Error bars represent one S.E. * P<0.05



Results from CPM and SPM had the similar tendency that Yucheng children got lower scores, but the scores were not statistically different at the eighth-year follow-up study.

4. Discussion

Data on the SPM and WISC-R test revealed that Yucheng children had consistently scored lower than their controls. The eighth-year data of WISC-R revealed that Yucheng children had a tendency to catch up with their controls in the cognitive development.

There seemed to be "learning effects" in the WISC-R IQ values for all the children. The IQ scores increased with year of examination and age. Nonetheless, the learning effects were similar in all the children.

Although the intellectual functioning of Yucheng children fell behind their controls, their intellectual functioning as a group did not reach retarded level as Harada reported on Japanese Yusho children³). Jacobson et al reported on prenatally PCB-exposed infants in the Michigan area. At birth, the results of the cognitive tests were normal. However, "delayed" deficits in visual recognition memory appeared at 7 months old⁴ and persistent poorer short-term memory functioning was found at 4 years old⁵). In contrast to our data and the data of Jacobson et al, Gladen and Rogan demonstrated that the developmental deficits seen at the age of 2 did not persist in the later years^{6,7}). The exposure levels of the Michigan and North Carolina mothers were lower than the Yucheng mothers. Therefore, it is comprehensible that Yucheng children would demonstrate more prominent and persistent neurobehavioral dysfunction than those children from Michigan or North Carolina.

In conclusion, the previously observed differences between the exposed and control children were not observed in the eighth-year of the follow-up study. Further studies are necessary to determine whether the catch-up will be continued to be observed.

5. References

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