

## Japan EMF Information Center

### Rapid Response Group

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#### Paper

Saito T, Nitta H, Kubo O, Yamamoto S, Yamaguchi N, Akiba S, Honda Y, Hagihara J, Isaka K, Ojima T, Nakamura Y, Mizoue T, Ito S, Eboshida A, Yamazaki S, Sokejima S, Kurokawa Y, Kabuto M. **Power-frequency magnetic fields and childhood brain tumors: a case-control study in Japan.** *J Epidemiol* 2010; 20(1): 54-61.

#### Summary

Saito and co-workers conducted an epidemiological study of brain cancer in children who were less than 15 years of age and diagnosed between 1999 and 2002 in five geographical regions covering 53.5% (10.7 million) of the total number of children in Japan. Exposure to magnetic fields (MF) from high-voltage power lines and electrical wiring and appliances within the home of 55 newly diagnosed children with brain tumor (cases) was compared with 99 randomly selected children without brain cancer but of the same age, gender and living in the same region (controls). The authors reported that brain tumor risk was elevated with increasing MF exposure ( $\geq 0.4 \mu\text{T}$ ).

In this study the association between the incidence of brain tumors and MF exposure at the place of residency was investigated. As with all epidemiological studies, causality cannot be proven from one association alone. So far, a biological mechanism has not been identified that could explain the observed association. In general, the Saito et al study was carefully conducted and the strengths and limitations are adequately discussed in the paper.

One of the strengths of the study is the assessment of MF exposure each child received. MF measurements of all study participants were made during one week in the children's bedroom. Additional measurements were conducted around their home. On average, measurements [in cases] were conducted just over 1 year after the diagnosis. Thus, measurements may not exactly represent the MF conditions prior to diagnosis, as the exposure situation may have changed since diagnosis. However, residential history was taken into account and study participants who had moved were not considered in the analyses.

The most important risk factors for brain tumors that could be related to MF exposure and might explain the observed association were considered in the analysis. Such factors, called confounders, are for example, educational level, smoking during pregnancy or X-ray examinations during pregnancy. However, it seems unlikely that the observed association reported by the authors is due to these confounding factors because no strong risk factors for childhood brain cancer are known.

As acknowledged by the authors, this study has limitations. The main limitation is the very small number of cases and controls. In the whole study only five cases and five controls had significant exposure to MF and in the highest exposure category there were only three cases and one control child. Thus, the risk estimate includes a high degree of statistical uncertainty;

a shift of one case or one control child to another exposure group would have had a marked impact on the risk estimate. This makes the estimation of any risk very imprecise.

Only 43% of the eligible cases and 27% of the eligible controls participated in the study, which is very low. In this case the two study populations may not be comparable leading to a bias of the risk estimate. In fact cases and controls differed in mothers education and while authors adjusted for this in the analysis this adjustment might not fully account for the difference.

Some 16 epidemiological studies examining possible associations between residential exposure to MFs and childhood brain tumors have been published, each usually suffering from very small numbers of exposed cases. A recent meta-analysis reported that the risk of brain cancer from MFs was close to one. This means the meta-analysis overall found no increase in childhood brain cancer risk, with the exception of high cut-point analyses (0.3/0.4  $\mu\text{T}$ ), where the possibility of a moderate risk increase could not be excluded (Mezei et.al. 2008).

In conclusion, the Saito et al study found indications that residential MF exposure increases the risk for developing a childhood brain tumor. However, because of the very low numbers of cases and controls in the high MF exposure group, and potential for bias, the risk estimates are very uncertain and substantially higher than in other studies.