



## Research Update

### No, electromagnetic fields don't cause cancer

The most comprehensive study to date of electric and magnetic field exposure (EMF) and childhood leukemia has concluded that there is no increased risk of leukemia in children exposed to EMF (*Am J Epidemiol* 1999;9:831-41.) The 10-year study, involving almost 800 children from 5 Canadian provinces, was led by Dr. Mary McBride, an epidemiologist at the British Columbia Cancer Agency.

The case-control study included 399 children with a diagnosis of leukemia (88% had acute lymphocytic leukemia), and the same number of control children matched with the case children for age, area and sex. The children were all from BC, Alberta, Saskatchewan, Manitoba and Quebec. The control group was randomly selected and considered representative of children without leukemia. The size of the study was a key strength, says McBride.

The study was the first in the world to monitor children's personal EMF exposure, through a specially designed backpack containing a meter that continuously measured and recorded EMF levels. The children wore the backpack for

48 hours except while sleeping and bathing. Parents wrote down the children's activities during the 48-hour period in a diary. As well, 24-hour measurements of EMF in the children's bedrooms were carried out. Researchers were also interested in the children's history of exposure to EMF, so perimeter measurements of EMF around all homes the children had lived in were recorded. Wire codes (power line configurations) on power poles adjacent to the children's residences were recorded, and researchers looked at the distance to power lines and magnetic fields in all of the children's residences throughout their lifetime.

In contrast to earlier studies, which suggested a relationship between certain power line configurations and increased risk of leukemia, this study "presents considerable evidence against such a relationship," says McBride.

Some previous studies have shown a higher incidence of leukemia in children who have moved frequently. In McBride's study, the mobility factor was controlled for in the analysis. — *Heather Kent, Vancouver*

### Yes, magnetic fields do cause cancer

Exposure to magnetic fields is associated with an increased risk of childhood leukemia, especially in children exposed before birth or in the first 2 years of life, those with a diagnosis of leukemia at less than 6 years of age, and those with acute lymphoblastic leukemia, according to a case-control study of children in southern Ontario (*Int J Cancer* 1999;82:161-70, *Cancer Causes Control* 1999;10:233-43).

The results conflict with those of the recent BC Cancer Agency study (see above), which found no increased risk of leukemia associated with electric and magnetic fields. "The studies were planned similarly," explains Dr. Lois Green, the principal author, who is with the Department of Public Health Sciences at the University of Toronto. However, there were some differences in the methodology and analysis that could account for the divergent findings.

A total of 201 children with leukemia were matched with 406 controls, and magnetic field exposure was estimated using wire codes in their homes and measured using point-in-time or "spot" measurements inside and outside the homes. Previous homes were also examined. The researchers found that when they analysed these data by age at diagnosis and "time windows" of exposure (prenatal, first 2 years of life, up to 2 years before diagnosis and during 2 years before diagnosis), the associations emerged. Magnetic fields of 0.15  $\mu$  or more on the outside perimeter of the house were associated with more than a threefold increase in leukemia risk. Green says

that the magnetic field strength in the upper quartile of exposure is "by no means unusual" in homes in southern Ontario.

In a separate analysis, 88 of the children with leukemia and 133 of the controls were also outfitted with personal monitoring devices. This analysis showed that higher levels of exposure to magnetic fields, as measured by the monitors, were associated with 4½ times the risk of leukemia, and confirmed the increased risk in children under 6 and for acute lymphoblastic leukemia.

This analysis also looked at electric fields, which, unlike magnetic fields, were associated with a decreased leukemia risk. Both analyses showed no association between living close to high-tension power lines and leukemia risk overall.

Green says that one of the strengths of the study was the use of personal monitors. "There is a lot of spatial and temporal variation in magnetic fields in residential environments. We felt therefore that the monitor on the child would best capture the variability of exposure."

Originally, Green and her colleagues hypothesized that exposure to magnetic fields in the 2 years before leukemia diagnosis might act as a "promoter" of the disease. However, the findings are more consistent with the theory that exposure during prenatal and early developmental stages is the critical factor.

The study was funded by Ontario Hydro, which has not commented on the results. — *C.J. Brown, CMAJ*