

Cancer News Article

Children Living Near High Voltage Power Lines Have Increased Risk of Leukemia

Researchers from England have reported that children living within 200 meters of high voltage power lines have a 70% increased risk of developing leukemia. The details of this large case control study were published in the June 4, 2004, issue of *The Lancet*. [1]

Some early research suggested that exposure to electromagnetic fields through living next to high voltage power lines was a possible risk factor for developing childhood leukemia. However, more recent studies have failed to document an increased incidence of childhood acute lymphocytic leukemia (ALL) in individuals living near power lines. The details of this report appeared in the June 6, 2005, issue of the *British Medical Journal*. [2]

The current study is the largest to examine the relationship between living close to high voltage power lines and the incidence of childhood leukemia. These researchers looked at the records of over 29,000 children between the ages of 0 and 14 years with cancer; including 9,700 with leukemia. They found that children who lived within 200 meters of high-voltage power lines had a 70% increased incidence of leukemia compared to individuals who lived more than 600 meters away. They also observed a 23% increased incidence in those living between 200 and 600 meters.

Although not mentioned, most of these cases must have been ALL as acute myeloid leukemia is relatively uncommon in children. They did not find an increased risk of other cancers. They emphasized that this was still a relatively small risk. Of the 400-420 annual childhood cases in England and Wales, they estimate that 5 would be due to living near high-voltage power lines. They also had no scientific explanation for this observed relationship as there are no animal models that explain this phenomenon.

Comments: Since this is the largest such study performed and competing variables were taken into account this appears to be a real finding even if there is no explanation for it.

References

[1]Khabir Ahmad. Living near high-voltage power lines could cause leukaemia. *The Lancet*. 2004;6:450.

[2]Draper G, Vincent T, Kroll ME, et al. Childhood cancer in relation to distance from high voltage power lines in England and Wales: a case-control study. *British Medical Journal*. 2005;330:1290-1294.

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BMJ. 2005 Jun 4;330(7503):1290.

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[BMJ. 2005 Jun 4;330\(7503\):1279-80.](#)

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[BMJ. 2005 Sep 17;331\(7517\):635; discussion 636; author reply 636-7.](#)

Childhood cancer in relation to distance from high voltage power lines in England and Wales: a case-control study.

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OBJECTIVE: To determine whether there is an association between distance of home address at birth from high voltage power lines and the incidence of leukaemia and other cancers in children in England and Wales.

DESIGN: Case-control study.

SETTING: Cancer registry and National Grid records.

SUBJECTS: Records of 29 081 children with cancer, including 9700 with leukaemia. Children were aged 0-14 years and born in England and Wales, 1962-95. Controls were individually matched for sex, approximate date of birth, and birth registration district. No active participation was required.

MAIN OUTCOME MEASURES: Distance from home address at birth to the nearest high voltage overhead power line in existence at the time.

RESULTS: Compared with those who lived > 600 m from a line at birth, children who lived within 200 m had a relative risk of leukaemia of 1.69 (95% confidence interval 1.13 to 2.53); those born between 200 and 600 m had a relative risk of 1.23 (1.02 to 1.49). There was a significant ($P < 0.01$) trend in risk in relation to the reciprocal of distance from the line. No excess risk in relation to proximity to lines was found for other childhood cancers.

CONCLUSIONS: There is an association between childhood leukaemia and proximity of home address at birth to high voltage power lines, and the apparent risk extends to a greater distance than would have been expected from previous studies. About 4% of children in England and Wales live within 600 m of high voltage lines at birth. If the association is causal, about 1% of childhood leukaemia in England and Wales would be attributable to these lines, though this estimate has considerable statistical uncertainty. There is no accepted biological mechanism to explain the epidemiological results; indeed, the relation may be due to chance or confounding.

http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=PubMed&list_uids=16059923&dopt=AbstractPlus

[Bioelectromagnetics](#). 2005;Suppl 7:S86-97.

Do magnetic fields cause increased risk of childhood leukemia via melatonin disruption?

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Epidemiological studies have reported associations between exposure to power frequency magnetic fields and increased risk of certain cancer and noncancer illnesses. **For childhood leukemia, a doubling of risk has been associated with exposures above 0.3/0.4 microT**. Here, we propose that **the melatonin hypothesis, in which power frequency magnetic fields suppress the nocturnal production of melatonin in the pineal gland**, accounts for the observed increased risk of childhood leukemia. Such melatonin disruption has been shown in animals, especially with exposure to electric and/or rapid on/off magnetic fields. Equivocal evidence has been obtained from controlled laboratory magnetic field exposures of volunteers, although the exposure conditions are generally atypical of neighborhood exposures. **In contrast, support for the hypothesis is found in the body of studies showing magnetic field disruption of melatonin in human populations chronically exposed to both electric and magnetic fields associated with electricity distribution**. Further support comes from the observation that melatonin is highly protective of oxidative damage to the human haemopoietic system. Aspects of the hypothesis are amenable to further investigation.

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Epidemiology. 2007 Jan;18(1):158-161.

Magnetic Fields and Acute Leukemia in Children With Down Syndrome.

Mejia-Arangure JM, Fajardo-Gutierrez A, Perez-Saldivar ML, Gorodezky C, Martinez-Avalos A, Romero-Guzman L, Campo-Martinez MA, Flores-Lujano J, Salamanca-Gomez F, Velasquez-Perez L.

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BACKGROUND: We analyzed effects of exposure to magnetic fields on the expression of acute leukemia in children with Down syndrome (who have a 20-fold higher risk of leukemia).

METHODS: We performed a case-control study that included 42 children with both acute leukemia and Down syndrome as cases and 124 healthy children with Down syndrome as controls. We obtained demographic information concerning the children and took spot measurements of magnetic fields at each residence.

RESULTS: The odds ratio for direct measurements of magnetic fields ≥ 6.00 mG was 3.7 (95% confidence interval = 1.05-13.1).

CONCLUSION: **The association between magnetic fields and leukemia in children with Down syndrome suggests the possibility of a causal role for magnetic fields in the etiology of leukemia among a genetically susceptible subgroup of children.**

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Remarque Ph. Hug :

Ce qui veut dire que le risque de contracter une leucémie chez les enfants avec le syndrome de Down est 4 fois plus grand à une valeur égale ou supérieure à 6 mG, c'est-à-dire 0,6 microTesla.

Pour rappel, les normes en Suisse (ORNI) autorisent 1 microTesla au domicile et dans les LUS, et 100 microTesla dans les LSM (Lieux a séjour momentané).

Et les guignols de la SUVA acceptent dans leurs limites p. 142, 143 de leur document "Valeurs limites d'exposition aux postes de travail 2007" 500 microTesla.

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=17525094&ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum)

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Occup Environ Med. 2007 Aug;64(8):553-9. Epub 2007 May 24.

Leukaemia, brain tumours and exposure to extremely low frequency magnetic fields: cohort study of Swiss railway employees.

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AIMS: To investigate the relationship between extremely low frequency magnetic field (ELF-MF) exposure and mortality from leukaemia and brain tumour in a cohort of Swiss railway workers.

METHODS: 20,141 Swiss railway employees with 464,129 person-years of follow-up between 1972 and 2002 were studied. Mortality rates for leukaemia and brain tumour of highly exposed train drivers (21 μ T average annual exposure) were compared with medium and low exposed occupational groups (i.e. station masters with an average exposure of 1 μ T). In addition, individual cumulative exposure was calculated from on-site measurements and modelling of past exposures.

RESULTS: The hazard ratio (HR) for leukaemia mortality of train drivers was 1.43 (95% CI 0.74 to 2.77) compared with station masters. For myeloid leukaemia the HR of train drivers was 4.74 (95% CI 1.04 to 21.60) and for Hodgkin's disease 3.29 (95% CI 0.69 to 15.63). Lymphoid leukaemia, non-Hodgkin's disease and brain tumour mortality were not associated with magnetic field exposure. Concordant results were obtained from analyses based on individual cumulative exposure.

CONCLUSIONS: **Some evidence of an exposure-response association was found for myeloid leukaemia and Hodgkin's disease**, but not for other haematopoietic and lymphatic malignancies and brain tumours.

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The heat shock-induced cell cycle arrest is attenuated by weak electromagnetic fields

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The heat shock-induced cell cycle arrest is attenuated by weak electromagnetic fields

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Abstract.

Stress-induced effects in human acute **leukaemia** cells (HL-60) were studied by flow cytometry using the fluorescent dye carboxyfluorescein succinimidyl ester which allows the analysis of several successive cell generations for up to 10 days. Asynchronously cycling cells subjected to heat shock (30 min at 41 °C) responded in two distinct ways: while one fraction of the cell population (about 15%) re-entered the cell cycle after a short delay, other cells became arrested at different phases of the cell cycle and remained arrested for up to several days and finally underwent apoptosis. Weak electromagnetic fields (60 μ T, 50 Hz) alleviated the heat-induced block and the fraction of arrested cells was significantly smaller.

[http://www.ncbi.nlm.nih.gov/sites/entrez?](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=14757377&ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum)

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[Environ Res.](#) 2004 Feb;94(2):145-51.

Weak electromagnetic fields (50 Hz) elicit a stress response in human cells.

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The aim of this study was to demonstrate the expression of heat shock (HS) genes in human cells in response to extremely low-frequency electromagnetic fields (ELF-EMF) alone and in combination with thermal stress. After exposing human myeloid leukemia (HL-60) cells to the stressor(s) for 30 min we quantified the expression of the HS genes HSP27, HSP60, HSP70 (A, B, and C), HSC70, HSP75, HSP78, and HSP90 (alpha and beta) by RT-PCR. The results clearly show that HS genes, in particular the three HSP70 genes (A, B, and C), are induced by ELF-EMF, a reaction that is enhanced by simultaneous HS (43 degrees C for 30 min). The results show similarities and some significant differences to previous experiments in which transgenic nematodes were used to monitor the induction of the HSP70 gene under similar stress conditions. We also studied the effect of different flux densities on gene expression in the range of 10-140 microT. **Even the lowest dose tested (10 microT) resulted in a significant induction of the genes HSP70A, HSP70B, and HSP70C.** The reaction to ELF-EMF shows a maximum at a flux density of 60-80 microT. The unusual dose-response relation reveals an interesting difference to other stressors that elicit the HS response.

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