

Exposure to 50-Hz Electric Field and Incidence of Leukaemia, Brain Tumors, and Other Cancers among French Electric Utility Workers

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Recent studies on the association between exposure to 50-to 60-Hz fields and cancer carried out among electric utility workers have focused mainly on the magnetic field component of exposure. The authors have investigated tumor risks specifically associated with electric fields, as this exposure is distinct from magnetic fields. The study design is a case-control study nested within a cohort of 170,000 workers employed at Electricite de France-Gaz de France (EDF) between 1978 and 1989. All incident cases of cancer and benign tumor of the brain diagnosed in 1978-1989 among workers before the age of retirement were included. Four randomly selected controls were individually matched to each case by year of birth. The exposure to electric fields was assessed from measurements collected in 850 EDF workers for a full work week. Arithmetic and geometric mean exposures were included in a job-exposure matrix to determine the cumulative exposure of the cases and the controls. Exposures to potentially carcinogenic chemicals found at the workplace were also evaluated through expert judgment. The analysis by site of tumor did not show any increased risk for leukaemia (72 cases). An odds ratio of 3.08 (95% confidence interval 1.08-8.74) was observed for all brain tumors (69 cases) for exposure above the 90th percentile (>387 V/m-year), and there was some indication of a dose-response relation, although the risk did not increase monotonically with exposure. No confounding from magnetic fields or from other potentially carcinogenic hazards was apparent. The observed association was somewhat stronger after allowing a 5-year latency period before diagnosis (odds ratio = 3.69, 95% confidence interval 1.10-12.43) for exposure above the 90th percentile. However, the risk of brain tumor could not be linked to a specific type of tumor. An unexpected association was also observed for colon cancer, using geometric indexes of exposure, but no other association was seen for any other type of cancer. Our study indicates that electric fields may have a specific effect on the risk of brain tumor, and that this should be taken into account in future analyses on the carcinogenic effects of 50-60-Hz fields.

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Brain neoplasms; case-control studies; colonic neoplasms; electromagnetic fields; leukaemia; occupational exposure