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[Annu Rev Public Health](#). 1992;13:173-96.

Biological interactions and potential health effects of extremely-low-frequency magnetic fields from power lines and other common sources.

[Tenforde TS](#).

Source

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Abstract

Various different effects of ELF magnetic fields have been reported to occur at the cellular, tissue, and animal levels. Certain effects, such as the induction of magnetophosphenes in the visual system, have been established through replication in several laboratories. Many other effects, however, have not been independently verified or, in some cases, replication efforts have led to conflicting results. A substantial amount of experimental evidence indicates that the effects of ELF magnetic fields on cellular biochemistry, structure, and function can be related to the induced current density, with a majority of the reported effects occurring at current density levels in excess of 10 mA/m². These effects, therefore, occur at induced current-density levels that exceed the endogenous currents normally present in living tissues. From this perspective, it is extremely difficult to interpret the results of recent epidemiological studies that have reported a correlation between cancer incidence and exposure to 50-Hz or 60-Hz magnetic fields with very low flux densities. The levels of current density induced in tissue by occupational or residential exposure to these fields are, in nearly all circumstances, significantly lower than the levels found in laboratory studies to produce measurable perturbations in biological functions. There is a clear need for additional epidemiological research to clarify whether exposure to ELF magnetic fields is, in fact, causally linked to cancer risk. Laboratory animal studies conducted under controlled conditions are also needed to determine whether ELF magnetic fields can initiate or promote tumors. In addition, more studies of both a theoretical and experimental nature are needed to elucidate the molecular and cellular mechanisms through which low-intensity magnetic fields can influence living systems. A growing body of evidence indicates that cell membranes play a key role in the transduction and amplification of ELF field signals. Elucidation of the physical and biochemical pathways that mediate these transmembrane signaling events will represent a major advance in our understanding of the molecular basis of magnetic field effects of biological systems.

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