

Review of Health Risks Associated with Electromagnetic Fields from 345kV Transmission Lines

This paper has been written with the intention of providing additional information regarding the potential health concerns associated with the proposed 345kV transmission line project through our area. My research was done at the Medical library at TAMU, internet searches, and I received valuable information directly from Oncor Electric. Please understand that I am not an expert in this particular field and I had to learn new terminology to understand the concepts but I do understand the inherent problems behind scientific research and the complexities with scientific proof and in short, there have been 100's of investigations into the association of electromagnetic fields and health risks and few have proven anything more than a suggestion of associated health risks.

Electric fields(EF) and Magnetic fields(EMF) are produced by any wiring or equipment carrying electric current, including overhead power lines, wiring in our homes, and electrical appliances. Except for the risk of shock ,EF are not considered a health risk so only EMF concerns will be addressed in this paper. Magnetic field strength is measured in microTeslas or milliGaus. One microTesla equals 10 milliGaus(mG). As a reference- the earth's magnetic force is 570mG.¹ Unlike the static current from the earth's magnetic force, the electromagnetic force created by alternating current creates a current through the body. EMF decreases significantly as distance from the source increases. Time or duration of exposure is also important as these effects are likely time-exposure dependent.

Many researchers have done hundreds of studies regarding potential health risks to humans and animals(I found one resource with 385 studies about animal effects).² These studies are generally classified as laboratory, clinical, case, or epidemiological. To date, although there is ample research proving EMF effects on humans and animals , laboratory and clinical studies have failed to consistently prove that a connection exists between exposure to EMF and disease.³ The epidemiology studies have raised some questions in several areas.

1.Childhood Leukemia- British study of 29,081 children with cancer including 9700 with leukemia showed a 1.5X incidence of leukemia in children whose homes were within 600 meters of a transmission line. No association with any other childhood cancers was found. Criticisms of the study are the small number of affected children

¹ Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut, Dec 14,2007.

² Review of Literature on the Effect of Electrical Environment on FarmAnimals, Reinemann, Dec 2005.

³ EMF-Electric and Magnetic Fields Associated with the Use of Electric Power, prepared by National Institute of Environmental Health Science, National Institute of Health,June 2002.

living within 600 meters of the lines⁴. Additional studies in Colorado and California in 1979 also showed a correlation.⁵ Fifteen animal laboratory studies regarding leukemia have failed to show an association.

2. Alzheimer's disease is increased 3-3.8 fold in electric workers -vs- the general population. Tailors and dressmakers actually had the highest rate- theory that close contact with EMF from sewing machines is a potential cause.⁶

3. A French clinical and laboratory study determined a cause-relationship between exposure to EMF and suppression of the immune system but failed to show any association with disease.⁷

4. Multiple studies have shown that EMF's affect humans and animals including decreases in melatonin hormone and changes in calcium movement into and out of cells(which have been used to stimulate bone healing with somewhat mixed results). A Czech study found that cattle and roe deer grazing and resting in open pastures had their normal N-S body orientation disrupted if they were within 150 meters of transmission lines.⁸

The National Institute of Environmental Health Sciences is the recognized leader in the safety of electromagnetic fields. They acknowledge that there is a weak association between EMF's and childhood leukemia and they have classified EMF as a Class II potential carcinogen. The World Health Organization also found a weak association with EMF and leukemia and issued a 2008 Policy Statement that planning, development, and upgrades of the transmission system minimize or reduce effects on(among other things) "sensitive activities"(defined as including schools, residential buildings and hospitals) with minimal economic impact.⁹ Oncor Electric feels that the 160 foot easement(80 feet on either side of the transmission line) meets these recommendations.

⁴ Childhood cancer in relation to distance from high voltage power lines in England and Wales:a case-study control, Draper,G, Vincent,T, Kroll,ME,Swanson,J.,British Medical Journal 2005.

⁵ EMF-Electric and Magnetic Fields Associated with the Use of Electric Power

⁶ Power-Line EMFs:New Focus on Alzheimer's Disease, Microwave News, Nov 17,2008.

⁷ Effects of Electromagnetic Fields on the Immune Systems of Occupationally Exposed Humans and Mice, Bonhomme-Faivre,L, Marion,S, Forester,F,Santini,R.,Auclair,H., Archive of Environmental Health,Nov 2003.

⁸ Extremely low-frequency electromagnetic fields disrupt magnetic alignment of ruminants, Burda et al.PNAS, April 2009.

⁹ EMF-Electric and Magnetic Fields Associated with the Use of Electric Power

In summary, there is little doubt that the electromagnetic fields associated with 345kV transmission lines do have cause and effects. However, among investigators there is a great deal of debate about the health risks associated with these effects. The failure to reproduce results under laboratory settings suggest that additional factors may be involved and that the risks to human and animal health are minimal. In my mind, the crucial factor is the distance of a residential home from the power line as EMF decreases as distance from the line increases. Published values for 230 and 500 kV lines exceeded the recommended exposure threshold level of 4mG at the edges of Oncor's required 80 foot from line right of way. At 100 ft from the 230kV line mean EMF was 7.1mG. The 500 kV line mean was 12.9mG at 100 ft. Values were 1.8 and 3.2 mG, respectively at 200 ft¹⁰. The 345kV line will be somewhere between these. As inconclusive as the vast number of studies regarding EMF risks have been, there is no doubt that many other factors pose a greater risk toward our own or our children's health, such as proximity to high traffic areas, smoking, and pollution, but I would still be very concerned if I had children less than 15 years old and the transmission line was within 200 feet of the house.

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¹⁰ EMF-Electric and Magnetic Fields Associated with the Use of Electric Power