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High-Voltage Power Lines: Are Victorians at Risk?

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Abstract

The recent publication of a UK report on the risks of power frequency electromagnetic fields, particularly high-voltage power lines, led to significant media interest and some concern among the Victorian public. The report authors reviewed the results from cellular research, animal experiments and epidemiology to provide a comprehensive assessment of the current cancer risks associated with power frequency electromagnetic fields. This article reviews the report findings and those of other studies on high-voltage power lines, looking at the implications for the Victorian public. Current scientific evidence does not demonstrate a causal link between any health impact and typical exposures to electromagnetic fields. However, a precautionary approach suggests, while the high cost of reducing current exposure from overhead power lines is not justifiable, that future unnecessary heavy exposures should be avoided if this is achievable without excessive costs or technical difficulties.

Introduction

The possibility that exposure to low-frequency electromagnetic fields, generated by electric currents, is associated with an increased risk of cancer has been debated since a link was first suggested in 1979. However, this initial work, relying on distances from power lines and on wiring configurations, did not measure electromagnetic fields.

Since that initial report, confirmatory data (either experimental or epidemiological) have not been available and serious limitations have been identified in nearly all studies on power lines and cancer. The lack of epidemiological support for the association even led a 1997 New England Journal of Medicine editorial to call for a cessation of studies on the topic because these were a ‘waste of research resources’.3

Electromagnetic fields from power lines are of extremely low frequency. Physicists believe that low levels of environmental exposure are unable to produce biological effects, because the amount of energy in these fields is below that required to break molecular bonds such as those in DNA.3

Debate on the topic was rekindled in Victoria recently when the Advisory Group on Non-Ionising Radiation (AGNIR) to the UK National Radiological Protection Board (NRPB), chaired by Sir Richard Doll, published a report on power frequen-
cy electromagnetic fields and the risk of cancer.\textsuperscript{4} The report updated previous AGNIR work on this topic\textsuperscript{5,6} and reviewed experimental and epidemiological data to support its conclusions.

**Experimental studies**

AGNIR found no clear evidence that exposure to power frequency electromagnetic fields at prevailing levels can affect biological processes.\textsuperscript{4} Further, it found no evidence that exposure to such fields is directly genotoxic or can bring about the transformation of cells in culture. Its review of a large number of animal studies found no convincing evidence of power frequency electromagnetic fields increasing the risk of cancer.\textsuperscript{4}

**Epidemiological Studies**

The recent availability of instruments to assess magnetic fields over periods of time has improved the quality of epidemiological studies.\textsuperscript{8} Combining the results from a number of large and well-conducted studies, the AGNIR report found some evidence that exposures of 0.4 microtesla ($\mu$T)—4 milligauss (mG)—or higher are associated with a doubling of the risk of leukaemia in children under 15 years of age. No effect was found at lower exposures.

The evidence for the effect remained ‘not conclusive’ because the key studies identified in the review might have suffered from selection bias or random variation. In addition, the review found no convincing evidence of an increased risk of other previously implicated cancers (such as brain tumours or leukaemia) in adults.

The threshold exposure level of 0.4 $\mu$T is such that only 0.5 per cent of the UK population is estimated to face such exposures. Around 75 per cent of this share are a long way from overhead power lines, instead being exposed in the home via household appliances and household wiring. With childhood leukaemia having an incidence rate of 4 out of 100 000 children per year,\textsuperscript{8} this increased risk from magnetic fields would equate to four extra Victorian cancer cases every 20 years, with three of these cases being unrelated to power line exposure.

The report recommends that further studies in the United Kingdom would be of little value, because the number of individuals exposed above 0.4 $\mu$T is too small to provide any useful information. Denmark and Sweden, on the other hand, are identified as countries where residential exposures over 0.4 $\mu$T are more common and where better quantitative information may be obtained on the size of the leukaemia risk in relation to electromagnetic fields.

The NRPB’s response to the report notes that if there is an increased risk of leukaemia in children living near high-voltage power lines, then it is such a small risk that ‘it has already been demonstrated in the UK childhood cancer study that it has not been possible to detect this increase in the UK’.\textsuperscript{4}

**Where to from here?**

The Australian guidelines for limiting exposure to electromagnetic fields, established by the National Health and Medical Research Council,\textsuperscript{10} are based on preventing established health effects. The maximum level under the guidelines for continuous exposure of the public to power frequency fields is 1000 mG, or 100 $\mu$T. The NRPB view is that the AGNIR report provides no additional scientific evidence to require a change in exposure guidelines. The Victorian Department of Human Services supports the view that current guidelines are adequate to protect the public and that no action is required to reduce exposure levels that are already well below the specified maximum limits.

**References**