

**EFFECTS OF 60 Hz ELECTRIC AND MAGNETIC FIELDS ON  
PRODUCTIVITY, REPRODUCTIVE HORMONES, PLASMA MINERALS AND  
MINERALS AND NEUROTRANSMITTER METABOLITES IN CEREBROSPINAL  
FLUID IN DAIRY CATTLE**

**ABSTRACT**

**Ph.D.**

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This study was designed to determine the potential biological effects of electric and magnetic fields (EMF), generated by 735 kV alternating current (AC) high tension lines upon the hormonal profile, some health-related parameters, stress response and productivity in dairy cattle. An EMF exposure chamber to house eight animals at one time was constructed. Forty-nine cows were divided according to their production stage; 8 pregnant non-lactating cows, 16 pregnant lactating cows, 16 non-pregnant lactating cows and 9 non-lactating non-pregnant heifers. They were exposed to an EMF of 10 kilovolts per meter (kV/m) and 30 micro-Tesla ( $\mu$ T) in two different fashions: a) for three consecutive periods of 28 days in two sequences either with the EMF on/off/on or off/on/off, in a switch back design; b) for three consecutive periods with the sequence OFF (5 days), ON (30 days) and OFF (5-12 days). The intensity

of the EMF chosen for the experiments resembled a situation in which the cattle are standing continuously under a 735 kV AC high tension line when the line has a maximum load of current. In reality, these conditions are found only for a few days during the winter in the Province of Québec.

Milk production and composition, feed consumption, blood hormonal profiles and cerebrospinal fluid (CSF) components were assessed during the different periods of exposure. Most of the variables assessed were not affected by EMF. However, there was a positive association between EMF and feed consumption, milk fat content, blood plasma progesterone during pregnancy and estrous cycle length. Also, there were changes in the mineral and neurotransmitter metabolite concentrations in the CSF that showed a relationship to the EMF.

In conclusion, it could be stated that EMF caused a biological response in dairy cattle. It is speculated that these changes do not represent a health hazard for exposed cattle, although they warrant further research.