

Thermal and Non-thermal Effects of Non-ionizing EMF

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There has been much debate on whether non-ionizing electromagnetic fields (EMF) could cause non-thermal biological effects, i.e., effects not related to heating or increase in temperature in tissues. Arguments for the existence of non-thermal effects are: 1) biological effects have been observed at low intensities of EMF exposure; 2) there are cases in which observed effects of EMF were different from those of heating; 3) EMF with different modulations produced different effects; and 4) biological effects of extremely-low frequency (ELF) EMF are well established and it is unlikely that ELF EMF could produce thermal heating. However, in most cases, it is very difficult to prove whether an observed effect after EMF exposure is thermal or non-thermal. In the setting of EMF exposure guidelines based on scientific data, whether an effect observed is thermal or non-thermal should not be a factor.