

Magnetic field effects on biological systems

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Abstract.

Current safety standards are set on the basis of relatively short term exposures to electric and magnetic fields. At low frequencies they are on the basis of exposures to relatively large electric fields in the vicinity of 5kV/m and at RF they are set on the basis of whole body heating and specific absorption rates (SARs). In this talk we will show that there are now both experimental and theoretical results that show that biological systems can sense electric fields at intensities as low as 5×10^{-5} V/m and magnetic flux densities at 0.5 μ T. One mechanism for sensing weak magnetic fields is the modification or radical concentrations of reactive oxygen species and hydrogen peroxide. Long term increases in reactive oxygen species are associated with ageing, cancers and Alzheimer's. We will present experimental data showing that changes in weak magnetic fields can lead to both increases or decreases in reactive oxygen and both increases and inhibition of the growth rates for some kinds of cancers. Additionally, it will be shown that feedback loops with a time delay in the feedback can lead to either gain or loss in biological processes so that different amplitudes, pulse repetition rates and modulation frequencies can be expected to lead to different results. An exciting prospect is that we may be able to learn how to use electric and magnetic fields to signal biological processes to perform therapeutic processes.

Additionally an estimate of the possible increase in the risk of brain tumors for heavy extended use of cell phones will be presented.