Effects of ELF (1–120 Hz) and modulated (50 Hz) RF fields on the efflux of calcium ions from brain tissue in vitro

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Abstract

We have previously shown that 16-Hz, sinusoidal electromagnetic fields can cause enhanced efflux of calcium ions from chick brain tissue, in vitro, in two intensity regions centered on 6 and 40 $V_{p\text{-}p}$/m. Alternatively, 1-Hz and 30-Hz fields at 40 $V_{p\text{-}p}$/m did not cause enhanced efflux. We now demonstrate that although there is no enhanced efflux associated with a 42-Hz field at 30, 40, 50, or 60 $V_{p\text{-}p}$/m, a 45-Hz field causes enhanced efflux in an intensity range around 40 $V_{p\text{-}p}$/m that is essentially identical to the response observed for 16-Hz fields. Fields at 50 Hz induce enhanced efflux in a narrower intensity region between 45 and 50 $V_{p\text{-}p}$/m, while radiofrequency carrier waves, amplitude modulated at 50 Hz, also display enhanced efflux over a narrow power density range. Electromagnetic fields at 60 Hz cause enhanced efflux only at 35 and 40 $V_{p\text{-}p}$/m, intensities slightly lower than those that are effective at 50 Hz. Finally, exposures over a series of frequencies at 42.5 $V_{p\text{-}p}$/m reveal two frequency regions that elicit enhanced efflux—one centered on 15 Hz, the other extending from 45 to 105 Hz.