The 12th INTERNATIONAL WORKSHOP OF ELECTROMAGNETIC COMPATIBILITY

EXPERIMENTAL CONFIGURATIONS FOR APPLYING THE ELECTROMAGNETIC FIELD IN THE STUDY OF BIOLOGICAL MATERIALS

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In this paper have been studied several experimental configurations of applying the electromagnetic field at different frequencies and intensities in order to investigate the effect of magnetic and electric field on biological materials.

To investigate the effect of magnetic and electric field, many wavesforms can be applied, at different frequencies and intensities by various modalities (fig. 1).

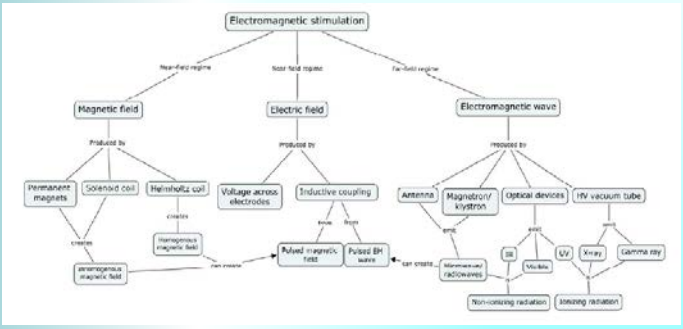

Fig. 1 Overview of various electromagnetic stimulation modalities from fields and waves, [1]

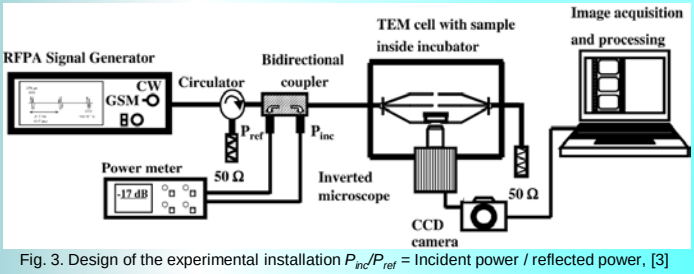

Fig. 3. Design of the experimental installation P_{inc}/P_{ref} = Incident power / reflected power, [3]

The system allowed the evolution of B16F10 metastatic melanoma cells in the stage of mitosis in a temperature and CO_2 controlled environment, before and after exposure to EMF. The exposure system was validated by cell endocytosis measurements. This study concluded that as the rate of endocytosis increased, no change in the duration and progression of mitosis was observed in cells exposed to a 900 MHz modulated electromagnetic field for 1 hour at 30°C and at a specific absorption rate of 2.2 W/kg.

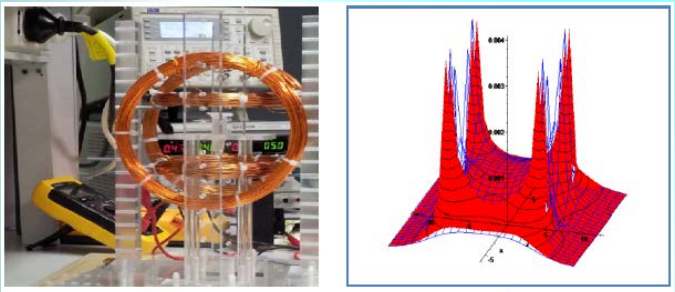

Fig. 4 (a) Experimental assembly for irradiation of *Staphylococcus aureus* bacterium and (b) total magnetic field strength of 1mT projected on the xz axis, Experimental assembly was used to generate uniform magnetic fields that varied over time with a frequency between 2-500 Hz and a magnetic induction of 0.5-2.5 mT, [4]

Findings from this research have direct implication in determining the optimal characteristics of the applied ELF PEMF for possible treatment of infected tissue and therefore, wound healing promotion.

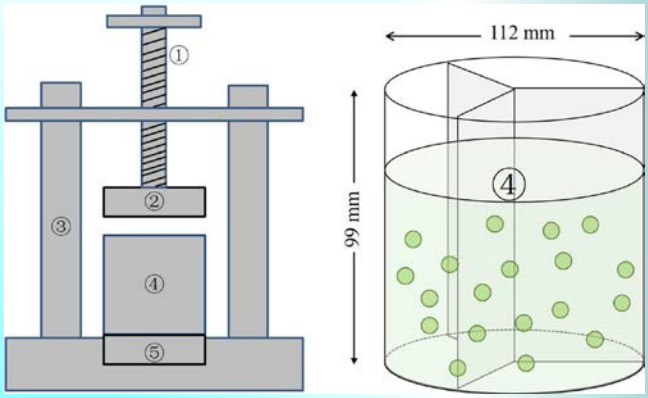

Fig. 2 A schematic of the static magnetic field treatment device consisting of a threaded rod, scale-plate, movable magnetic pole, fixed pole (Fig. 2(a)), and a custom-built container (Fig. 2(b)), [2]

In this study, *Chlorella vulgaris* treated with SMF was investigated in terms of the algal density, biomass, extracellular polysaccharide content and distribution, percentage of algal aggregation, total protein content, enzyme activity, malondialdehyde content, and nutrient removal. The magnitude of the magnetic field was ranging from 200 Gs to 2000 G. The algae treated by 800 G SMF grew at the fastest rate and SMF had a significant effect on *C. vulgaris* biomass.

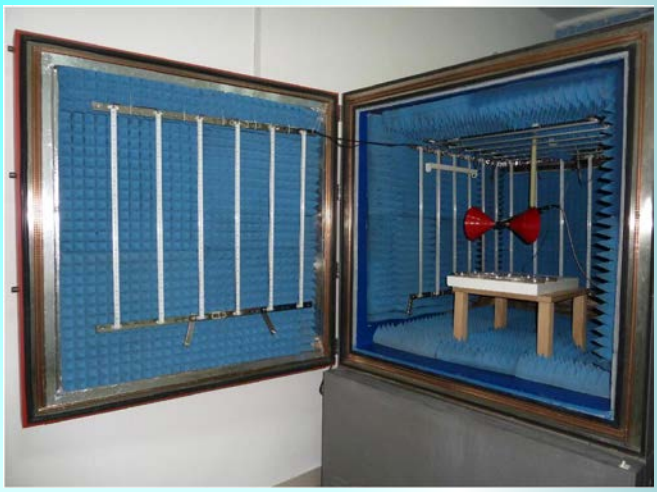

Fig. 5 Radio frequency electromagnetic field exposure system, [5]

Photosynthesis of *Microcystis aeruginosa* under Electromagnetic Radiation (1.8 GHz, 40 V/m) was studied by using the proteomics and the results indicated that electromagnetic radiation changed the photosynthesis related protein expression levels.

Conclusion: The literature presents numerous studies on cell proliferation, cell cycle regulation, cell differentiation, cell metabolism and various psychological characteristics of cells in the presence of the EM field. Exposure in the EM field can affect various cellular components, processes and systems. It was found that biological effects depend on field strength, frequency, pulse shape, type of modulation, magnetic intensity and duration of exposure.

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