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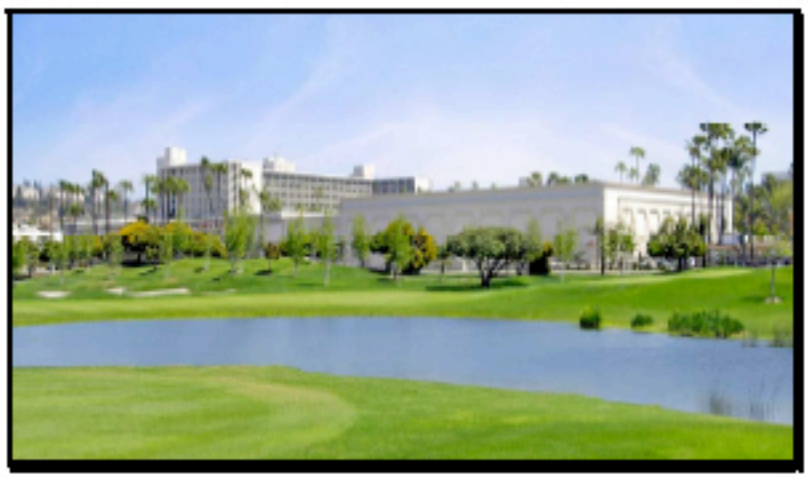

MORPHOLOGICAL TRANSFORMATION OF THE PROTOZOA BLEPHARISMA BY FREQUENCY SPECIFIC AMPLITUDE MODULATED RF PULSED PLASMAS

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Objectives. Proof-of-concept experiments demonstrating that frequency specific, low power, pulsed, amplitude modulated (AM) radio frequency (RF) fields utilizing an enclosed gas plasma antenna, can have dramatic disruptive effects on some biological organisms. Specific harmonic and dissonant tonal relationships between input frequencies in AM RF pulses are explored and correlations are drawn between these relationships and the level of biological effects. The biological effects are photographed and video taped.

Methods. Two types of plasma bulbs were tested: 1) an 8 inch diameter round 'phanotron' glass bulb filled with 100% helium and having two internal electrodes and 2) an 18 inch long, 1 inch diameter argon/neon mixture tube with an internal 'getter'. A custom designed digital sound synthesis program was developed for a laptop computer, capable of generating sine or square waves with selectable duty cycles in the audio range (20Hz-20Khz). These audio-range waveforms were used as input to control the amplitude modulation (AM) of a 27 Mhz carrier signal of an RF transmitter (OM1 from Plasmasonics Ltd.) where the index of modulation was higher than 1. This 'over-modulation' of the RF carrier results in a pulsed RF output from the transmitter. These pulses are then used to stimulate the noble gasses of helium, or argon, or a combination of argon and neon into a plasma state. The plasma bulb is located between 5 and 6 inches from the stage of an Olympus BX60 research microscope with a high-resolution video camera. Slides of living microorganisms are set on the microscope stage, exposed to the RF pulsed plasma field and the results are photographed and videotaped in real time. Waveform and spectrum output of the plasma device are analyzed and correlations are made between waveform pulse shapes, spectral content, and biological effects. Various types and combinations of waveforms and frequencies were tested as input for controlling the AM pulsed RF signal.

Results. The primary organism utilized in these experiments was the single celled protozoa blepharisma. The experiments have resulted in microphotograhic and videotape evidence of morphological transformations in hundreds of blepharisma caused by frequency specific amplitude modulated, pulsed RF fields utilizing an enclosed gas plasma antenna. Five primary effects have been documented: 1) complete disintegration of an organism [see Figure 1 below], the remnants of which often assemble spontaneously into numerous round membraneous structures (spheroids); 2) post-disintegration fusion of these negatively charged membraneous spheroids, overcoming any natural repelling of like charges; 3) partial disintegration of an organism during which a remnant of the organism seals itself off, retaining motive cilia, and survives autonomously following the experiment (birth of a new organism?); 4) partial disintegration of an organism forming some membraneous spheroids but leaving some of the organism intact but apparently nonfunctional; 5) general size expansion and distortion of the organism's shape accompanied by dissolution of internal structures (vacuoles etc.) and general loss of motility, often ending in elimination of all cilia action.

Initial results indicated that blepharisma were sensitive to an amplitude modulation control input signal of 924Hz., causing effects described in point 5 above. Subsequent experiments showed that a combination of two square waves (50% duty cycle) was extremely effective in producing disruptive biological effects when the lower square wave's frequency was between 924Hz-933Hz and when the higher frequency was tuned to the 11^{th} harmonic of the lower square wave, a dissonant musical interval relationship known as a compound tritone. Waveform and spectrum analysis indicated that square waves generated in the audio band (20Hz-20Khz), and used to control the amplitude modulation of the transmitter's RF carrier, generated many hundreds (possibly thousands) of sideband frequencies ranging from the audio region to over 150Mhz. Subsequent experiments with real time spectrum analysis indicated that changing the mathematical relationships between the two square wave inputs could result in the intentional 'steering' of many sideband locations well up into the Mhz range, allowing one to increase or decrease the spectral density at chosen locations in the frequency domain.

CONCLUSIONS. The protozoa blepharisma can undergo dramatic and disruptive morphological transformations caused by frequency specific, low power, pulsed, amplitude modulated radio frequency (RF) fields utilizing an enclosed gas plasma antenna. Five different types of changes in organisms have been documented. Biological effects seem to be most pronounced when two or three simultaneous and harmonically related square wave frequencies are used as input controls for the AM with the index of modulation exceeding 1 within the RF transmitter, resulting in a pulsed RF output which contains a wideband spectrum reaching as high as 150Mhz. Spectrum analysis shows that harmonically related audio range square waves can create a greater spectral energy density at specific locations in the frequency domain, serving to group sidebands into focused areas of greater spectral intensity and this correlates with the biological effects documented. Waveform analysis reveals that a correlation may exist between the biological effects, the number of RF pulses per second and the shape of pulse amplitude envelopes.

FIGURE 1: Disintegration in progress of the protozoa blepharisma caused by a frequency specific amplitude modulated RF pulsed plasma. Photo taken through an Olympus BX60 research microscope

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