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(54) **Title:** NEAR-INFRARED ELECTROMAGNETIC MODIFICATION OF CELLULAR STEADY-STATE MEMBRANE POTENTIALS

(57) **Abstract:** Systems and methods are disclosed herein for applying near-infrared optical energies and dosimetries to alter the bioenergetic steady-state trans-membrane and mitochondrial potentials ($\Delta\Psi$ -steady) of all irradiated cells through an optical depolarization effect. This depolarization causes a concomitant decrease in the absolute value of the trans-membrane potentials $\Delta\Psi$ of the irradiated mitochondrial and plasma membranes. Many cellular anabolic reactions and drug-resistance mechanisms can be rendered less functional and/or mitigated by a decrease in a membrane potential $\Delta\Psi$, the affiliated weakening of the proton motive force Δp , and the associated lowered phosphorylation potential ΔG_p . Within the area of irradiation exposure, the decrease in membrane potentials $\Delta\Psi$ will occur in bacterial, fungal and mammalian cells in unison. This membrane depolarization provides the ability to potentiate antimicrobial, antifungal and/or antineoplastic drugs against only targeted undesirable cells.

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A CLASSIFICATION OF SUBJECT MATTER IPC(8) - C12N 5/00 (2009.01) USPC - 435/375 According to International Patent Classification (IPC) or to both national classification and IPC		
B FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC(8) - C12N 5/00 (2009 01) USPC - 435/375 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 604/20, 607/88 (Text Search) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST (PGPB, USPT, USOC, EPAB, JPAB), DialogPRO (Engmeeng), PubMed and Google Scholar near infrared, microbial, membrane, Smembrane, potential, proton electrochemical gradient, ton electrochemical gradient, permeabS, depolarS, fungi, fungus, antifungal, anti-fungal, neoplastic, cancer, tumor, gradient		
C DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
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Y	US 2005/0054108 A1 (MONK et al) 10 Mar 2005 (10 03 2005) para [0003], [0016], [0143], [0151]-[0152]	15 and 17
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2006/0183728 A1 (KELLY) 17 Aug 2006 (17.08.2006) para [0010]-[0011], [0128], [0134]-[0137]	19-22 and 25
Y	US 2007/0149554 A1 (KUO et al.) 28 Jun 2007 (28.06.2007) para [0030], [0034]	23-24