

Claims

1. A treatment or diagnosis composition comprising
 - (a) a combination of
 - (1) free base tetrakis *Ar* substituted porphyrine *core* without metal or halide substitution wherein each of the four *Ar* substituents are at meso positions, are the same, and are selected from an *Ar* group consisting of any of ortho-, meta-, or para-hydroxyphenyl and alkyl pyridyl ,
 - (2) dihydroxynaphthalene or hydroxynaphthalene,
 - (3) hydrated metal having a +3 ionic state with spatial attributes at molecular level at or near that occupied by Fe(III) and
 - (b) resultant effect of combinations of 1.(a)(1), 1.(a)(2) and 1.(a)(3).
2. A composition in accordance claim 1 wherein resultant effect 1.(b) is one or more chemotherapeutic therapies selected from group consisting singlet oxygen, hydroxyl radical, and Juglone or its derivatives.
3. A composition in accordance claim 1 which has multifunctional activity for treatment or diagnosis in absence of or presence of light and in either, or both, aerobic and anaerobic conditions as determined by ratios of 1.(a)(1), 1.(a)(2) and 1.(a)(3).
4. A composition in accordance claim 1 wherein said resultant effect 1.(b) comprises singlet oxygen, hydroxyl radical, and Juglone or its derivatives and said 1.(a)(3) hydrated metal is increased or decreased in relation of said 1.(a)(1) porphyrine or said 1(a)(2) naphthalene to change of relative amounts of resultant effect of said singlet oxygen, hydroxyl radical, and Juglone or its derivatives.
5. A composition in accordance claim 1 comprising 1.(a)(1) selected from one or more of the group consisting of meso-tetrakis(N-methyl-4-pyridyl) porphine tetrachloride, meso-tetrakis(o-hydroxyphenyl)porphine, meso-tetrakis(m-hydroxyphenyl)porphine, and meso-tetrakis(p-hydroxyphenyl)porphine and 1.(a)(2) of dihydroxynaphthalene and 1.(a)(3) of Fe(III) chloride and 1.(b) resultant effect comprising hydroxyl radical.

6. A composition in accordance claim 1 comprising an aqueous solution of 1.(a)(1) selected from one or more of the group consisting of meso-tetrakis(N-methyl-4-pyridyl) porphine tetrachloride, meso-tetrakis(o-hydroxyphenyl)porphine, meso-tetrakis(m-hydroxyphenyl)porphine, and meso-tetrakis(p-hydroxyphenyl)porphine and 1.(a)(2) of dihydroxynaphthalene and 1.(a)(3) of Fe(III) chloride and 1.(b) resultant effect comprising one or more of hydroxyl radical, singlet oxygen, and Juglone or its derivatives and the ratio of mole of 1.(a)(3) Fe(III) chloride is increased or decreased in relation to mole of 1.(a)(1) or 1(a)(2) to change of resultant effect ratios of said singlet oxygen, hydroxyl radical, and Juglone or its derivatives.
7. A composition in accordance claim 1 resulting from combination of 1.a of TMPyP with 1.b. of 1,5-DHN and 1.(c) of hydrated Fe(III) in mole ratios of (i) TMPyP to 1,5-DHN of 1 to 18 to 22, (ii) TMPyP to Fe(III) ions of 1 to 15 to 18.33 and (iii) 1,5-DHN to Fe(III) of 1.1 to 1.3, preferably initial mole ratios of 1.(a) TMPyP to 1.(b) DHN to 1.(c) Fe(III) of 1 to 20 to 16.67, and wherein final concentration of hydrated Fe(III) is selected to achieve desired rate of photooxidation of DHN by TMPyP.
8. A treatment system comprising 1,5-dihydroxynaphthalene, meso-tetra(N-methyl-4-pyridyl)porphine tetrachloride and Fe(III) chloride in aqueous solution which is multifunctional by producing in situ at least one non-toxic chemotherapeutic agent from a single dose in presence of visible light or in absence of light, effective as treatment composition in both aerobic and anaerobic environments as well as in H₂O₂ rich environment which produces O₂ from excess H₂O₂ when H₂O₂ is present and produces both (a) singlet oxygen and hydroxyl radicals in aerobic conditions and (b) hydroxyl radicals in anaerobic conditions.
9. A treatment system in accordance with Claim 8 wherein 1.(a) is TMPyP, 1.(b) is DHN and 1.(c) is Fe(III) ions at mole ratios of 1 TMPyP to 20 DHN to 16.67 for initial Fe(III), and 1.(a) is TMPyP as 1.8×10^{-8} moles of TMPyP obtained from (3 mL of 6.0×10^{-6} M), equivalent of 1.47×10^{-5} g (Mwt for TMPyP-818.20), 1.(b) is 1,5-DHN present in amount of 3.6×10^{-7} moles obtained from (36 μ L of 1.0×10^{-2} M), equivalent to 5.67×10^{-5} g (Mwt for DHN-160.05) and 1.(c) is hydrated Fe(III) ions in an initial amount of of 3.0×10^{-7} moles obtained from (30 μ L of 1.0×10^{-2} M), equivalent to 4.82×10^{-5} g (Mwt for FeCl₃-160.84) but adjustable from the range of 15 μ L of 1.0×10^{-2} M to 50 μ L of

1.0 × 10⁻² M to adjust rate of photooxidation of DHN by TMPyP and 1.(b) is one or more chemotherapeutic result effects selected from group consisting singlet oxygen, hydroxyl radical, and Juglone or its derivatives.

- 5 10. A method to produce one or more reactive oxygen species and Juglone or its derivatives in situ as resultant effect of combination of ArPP, DHN, and hMe(III), wherein optionally mole ratio of hMe(III) is increased or decreased in relation to mole ratios of ArPP and DHN to selectively produce greater or lesser amount of one reactive oxygen species or Juglone or its derivatives over other resultant effects.
- 10 11. A method to produce hydroxyl radicals in situ by combining ArPP, DHN, and hMe(III) in presence of light or absence of light, wherein in absence of light and in anaerobic conditions, hydroxyl radical ($\dot{\text{O}}\text{H}$) is produced upon reacting with hydrogen peroxide (H_2O_2).
- 15 12. A method to produce hydroxyl radicals in situ in a condition which is aerobic, anaerobic, or H_2O_2 rich environment or any sequence or combination of said conditions, by combining ArPP, DHN, and hMe(III) in presence or absence of light wherein in absence of light and in anaerobic conditions, hydroxyl radical ($\dot{\text{O}}\text{H}$) is produced upon
- 20 reacting combination of ArPP, DHN, and hMe(III) with hydrogen peroxide (H_2O_2).
- 25 13. A method to produce Juglone or Juglone derived chemotherapeutics in situ in a condition which is aerobic, anaerobic, or H_2O_2 rich environment or any sequence or combination of said conditions, by combining ArPP, DHN, and hMe(III) in presence or absence of light.
- 30 14. A method to produce singlet oxygen in situ in a condition which is which is aerobic, anaerobic, or H_2O_2 rich environment or any sequence or combination of said conditions by combining ArPP, DHN, and hMe(III) in presence of light.
15. A method of producing in presence of visible light and in aerobic condition one or more of singlet oxygen ($^1\text{O}_2$), hydroxyl radical ($\dot{\text{O}}\text{H}$), Juglone or Juglone derivatives by combining ArPP, DHN, and hMe(III).

16. A method of producing in absence of light and in anaerobic condition one or more of hydroxyl radical ($\dot{\text{O}}\text{H}$) derived from hydrogen peroxide (H_2O_2), Juglone or Juglone derivatives by combining ArPP, DHN, and hMe(III).
- 5 17. A method of producing one or more non-toxic chemotherapeutic treatments by combining ArPP, DHN, and hMe(III) by forming at or near mammalian tissue or fluid in one or more regions of treatment
- (a) in presence of visible light
- (1) in an aerobic condition singlet oxygen ($^1\text{O}_2$), hydroxyl radical ($\dot{\text{O}}\text{H}$),
- 10 and one or more of Juglone or Juglone derivatives, then concurrently or sequentially
- (2) in an anaerobic condition, hydroxyl radical ($\dot{\text{O}}\text{H}$) and Juglone or Juglone derivatives,
- then forming either concurrently or subsequently forming at or near mammalian tissue or fluid in one or more different regions of treatment
- 15 (b) in absence of light,
- (1) hydroxyl radical ($\dot{\text{O}}\text{H}$) upon reacting ArPP, DHN, and hMe(III) with hydrogen peroxide (H_2O_2) and one or more of Juglone or Juglone derivatives.
18. A method to treat tumor hypoxia by oxygenating a less well-oxygenated necrotic region of a solid mammalian tumor having a wide range of oxygen concentrations not just at extremes of fully oxygenated or fully hypoxic, by combining ArPP, DHN, and hMe(III) by adjusting concentration of hMe(III) ions combined with DHN and ArPP to enable control of the rate of oxidation of DHN by ArPP in the presence of selected amounts of hMe(III) ions to form a tailored treatment composition as non-toxic
- 20 chemotherapeutic agent of choice by selectively activating one or more of resulting reaction products of singlet oxygen ($^1\text{O}_2$), hydroxyl radical ($\dot{\text{O}}\text{H}$), Juglone, or its derivatives as nontoxic reaction product or product of choice in lieu of one or more of other reaction products.
- 25 19. A portable field treatment kit for preparation and administration of treatment composition mixture for use at remote locations, or for use when rapid preparation and administration are preferred for reasons other than location, comprising
- (a) visible light resistant durable but flexible package with one or more exterior layers,
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(b) at least 3 separate sealed, compartments within said exterior layer, with 1 compartment of premeasured quantities of each component ArPP, DHN, and hMe(III). and optionally a compartment for excipient for injection or topical use, all within a single package or assembled separately as a collection of packages, each compartment being breakable upon application of pressure to exterior layers enable combining ArPP, DHN, and hMe(III), with optional excipient in any, to form treatment composition with optional excipient and

(c) syringe and needle or other extracting and administering means to extract and inject or topically dispense the treatment composition with optional excipient.

20. A portable field treatment kit in accordance with Claim 19 wherein preparation of treatment composition mixture and its application can be completed at remote location within one (1) hour or less.