

WHAT IS CLAIMED IS:

1. A method for delivering a substance across a blood brain barrier of a subject's brain, the method comprising:
 - applying an alternating electric field to the subject's brain for a period of time, wherein application of the alternating electric field to the subject's brain for the period of time increases permeability of the blood brain barrier in the subject's brain; and
 - administering the substance to the subject after the period of time has elapsed, wherein the increased permeability of the blood brain barrier allows the substance to cross the blood brain barrier.
2. The method of claim 1, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz.
3. The method of claim 1, wherein the period of time is at least 24 hours.
4. The method of claim 1, wherein the period of time is at least 48 hours.
5. The method of claim 1, wherein the alternating electric field has a field strength of at least 1 V/cm in at least a portion of the subject's brain.
6. The method of claim 1, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz, the period of time is at least 24 hours, and the alternating electric field has a field strength of at least 1 V/cm in at least a portion of the subject's brain.
7. The method of claim 1, wherein the administering of the substance is performed intravenously.
8. The method of claim 1, wherein the administering of the substance is performed orally.
9. The method of claim 1, wherein the subject's brain is tumor-free.
10. The method of claim 1, wherein the substance comprises a drug for treating a disease.

11. The method of claim 10, wherein the drug comprises a cancer treatment drug, an infectious disease treatment drug, a neurodegenerative disease treatment drug, an autoimmune disease treatment drug, an anti-epileptic drug, a hydrocephalus drug, a stroke intervention drug, or a psychiatric drug.
12. The method of claim 1, wherein the substance is used for monitoring brain activity.
13. The method of claim 12, wherein the substance is a brain dye, a reporter, or a marker.
14. The method of claim 1, further comprising discontinuing the application of the alternating electric field to allow the blood brain barrier to recover.
15. A method for delivering a substance across a blood brain barrier of a subject's brain, the method comprising:
 - applying an alternating electric field at a first frequency to the subject's brain for a period of time, wherein the first frequency is less than 190 kHz and the period of time is at least 24 hours, wherein application of the alternating electric field at the first frequency to the subject's brain for the period of time increases permeability of the blood brain barrier in the subject's brain; and
 - administering the substance to the subject after the period of time has elapsed, wherein the increased permeability of the blood brain barrier allows the substance to cross the blood brain barrier.
16. The method of claim 15, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz.
17. The method of claim 15, wherein the period of time is at least 48 hours.
18. The method of claim 15, wherein the alternating electric field has a field strength of at least 1 V/cm in at least a portion of the subject's brain.
19. The method of claim 15, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz, and the alternating electric field has a field strength

of at least 1 V/cm in at least a portion of the subject's brain.

20. A method for delivering a substance across a blood brain barrier of a subject's brain, the method comprising:

applying an alternating electric field at a first frequency to the subject's brain for a period of time, wherein the subject's brain is tumor-free, wherein application of the alternating electric field at the first frequency to the subject's brain for the period of time increases permeability of the blood brain barrier in the subject's brain; and

administering the substance to the subject after the period of time has elapsed, wherein the increased permeability of the blood brain barrier allows the substance to cross the blood brain barrier.

21. The method of claim 20, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz.

22. The method of claim 20, wherein the period of time is at least 24 hours.

23. The method of claim 20, wherein the period of time is at least 48 hours.

24. The method of claim 20, wherein the alternating electric field has a field strength of at least 1 V/cm in at least a portion of the subject's brain.

25. The method of claim 20, wherein the alternating electric field is applied at a frequency between 75 kHz and 125 kHz, the period of time is at least 24 hours, and the alternating electric field has a field strength of at least 1 V/cm in at least a portion of the subject's brain.

26. A method for treating a tumor in a subject's brain and delivering a substance across a blood brain barrier of the subject's brain, the method comprising:

applying a first alternating electric field at a first frequency to the subject's brain for a first period of time, wherein application of the first alternating electric field at the first frequency to the subject's brain for the first period of time increases permeability of the blood brain barrier in the subject's brain;

administering the substance to the subject after the first period of time has elapsed,

wherein the increased permeability of the blood brain barrier allows the substance to cross the blood brain barrier; and

applying a second alternating electric field at a second frequency to the subject's brain for a second period of time that is at least one week long, wherein the second frequency is different from the first frequency, wherein the second alternating electric field at the second frequency has an intensity that is sufficiently large to inhibit the tumor.

27. The method of claim 26, wherein the first frequency is between 75 kHz and 125 kHz.

28. The method of claim 26, wherein the first frequency is between 50 kHz and 190 kHz.

29. The method of claim 28, wherein the second frequency is between 190 kHz and 210 kHz.

30. The method of claim 26, wherein the first period of time is at least 24 hours.

31. The method of claim 26, wherein the second period of time comprises a single uninterrupted interval of time that is at least one week long.

32. The method of claim 26, wherein the second period of time comprises a plurality of non-contiguous intervals of time during which the second alternating electric field at the second frequency is applied to the subject's brain, wherein the plurality of non-contiguous intervals of time collectively add up to at least one week.

33. A method as in any of claims 1-33, wherein the substance has a molecular weight of at least 4 kDa.

34. A method as in any of claims 1-33, wherein the substance has a molecular weight of at least 69 kDa.

35. A method as in any of claims 1-33, wherein the substance has at least one characteristic that ordinarily impedes the substance from crossing a non-leaky BBB.

36. An apparatus for treating a tumor in a subject's body and facilitating delivery of a

substance across a blood brain barrier of the subject's body, the apparatus comprising:

an AC voltage generator capable of operating at a first frequency between 50 and 190 kHz and a second frequency between 50 and 500 kHz, wherein the second frequency is different from the first frequency, the AC voltage generator having a control input, wherein the AC voltage generator is configured to output the first frequency when the control input is in a first state and to output the second frequency when the control input is in a second state; and

a controller programmed to (a) place the control input in the second state so that the AC voltage generator outputs the second frequency, (b) accept a request to switch to the first frequency, (c) upon receipt of the request, place the control input in the first state so that the AC voltage generator outputs the first frequency for an interval of time, and (d) after the interval of time has elapsed, place the control input in the second state so that the AC voltage generator outputs the second frequency.

37. The apparatus of claim 36, further comprising:

a set of electrodes configured for affixation to the subject's body; and
wiring that connects an output of the AC voltage generator to the set of electrodes.

38. The apparatus of claim 36, wherein the first frequency is between 75 kHz and 125 kHz, and the second frequency is between 150 kHz and 250 kHz.

39. The apparatus of claim 36, wherein the interval of time is at least 24 hours.

40. The apparatus of claim 36, wherein the interval of time is at least 72 hours.

41. The apparatus of claim 36, wherein the controller is further programmed to, subsequent to the receipt of the request, switch the control input back and forth between the first state and the second state.

42. The apparatus of claim 36, wherein the AC voltage generator is capable of operating at at least one additional frequency between 50 and 500 kHz, and wherein the AC voltage generator is configured to output the at least one additional frequency when the control input is in at least one additional state, and

wherein the controller is programmed to cycle the control input through the second

state and the at least one additional state prior to receipt of the request, and to cycle the control input through the second state and the at least one additional state after the interval of time has elapsed.

43. The apparatus of claim 36, further comprising a user interface, wherein the request is accepted via the user interface.

44. The apparatus of claim 36, wherein the request is accepted via RF.