CLAIMS

What is claimed is:

1. A method for illumination of a vascular space and its contents, comprising;

providing a vascular access device comprising a waveguide, wherein at least a portion of the waveguide is within a vascular space;

transmitting a first illumination through the waveguide over a first time interval, wherein the first illumination induces a first effect within the vascular space; and,

transmitting a second illumination through the waveguide over a second time interval, wherein the second illumination induces a second effect within the vascular space; and,

wherein the second effect at least partially reverses the first effect.

2. The method of claim 1, wherein the first illumination comprises an ultraviolet wavelength.

3. The method of claim 2, wherein the first illumination further comprises a light wavelength from 400nm to 1200nm.

4. The method of any of claim 1 to claim 3, wherein the second illumination comprises a light wavelength range of 520nm to 540nm.

5. The method of claim 4, wherein the second illumination further comprises a light wavelength range of 620nm to 640nm.

6. The method of any of claim 1 to claim 5, wherein the first illumination comprises a plurality of light wavelength ranges, wherein at least one of the plurality of wavelengths is a member of the group consisting of UVA, UVB, and UVC.

7. The method of any claim 1 to claim 6, wherein the second irradiation comprises a plurality of light wavelength ranges, including a light wavelength range of 520nm to 540nm.

8. The method of any of claim 1 to claim 7, wherein the first time interval exceeds 1 second.

9. The method of any of claim 1 to claim 8, wherein the second time interval exceeds 1 second.

10. The method of any of claim 1 to claim 9, comprising the additional step of delivering fluids to the vascular space through the vascular access device.

11. An electromagnetic energy source (**100**) for illumination of a vascular space, comprising;

a plurality electromagnetic energy emitters (**130**);

one or more optical cable connectors (**140**), wherein the optical cable connector (**140**) is in optical communication with at least one of the plurality of electromagnetic energy sources (**130**);

one or more optical cables (**150**), comprising a hub that is configured to provide an optical interface with the optical cable connectors;

a processor (**170**), wherein the processor (**170**) is configured to modulate optical communication between at least one of the plurality of electromagnetic energy emitters (**130**) and the optical cable connector (**140**); and

a database (**180**) that is communicatively linked to the processor (**170**), wherein the database (**180**) comprises one or more illumination protocols and wherein the illumination protocol comprises instructions for modulation of an electromagnetic energy emitter (**130**), and wherein the database (**180**) further comprises data related to a calibration of at least one of the plurality of electromagnetic energy sources (**130**).

13. The electromagnetic energy source (**100**) of claim 11 or claim 12, wherein the processor (**170**) is configured to modify a base illumination protocol based upon data stored in the database (**180**) to generate a modified illumination protocol.

14. The electromagnetic energy source (**100**) of any claim 11 to claim 13, further comprising a mount configured to affix the electromagnetic energy source to a pole.

15. The electromagnetic energy source (100) of any of claim 11 to claim 14, further comprising a calibration port (**160**).

16. The electromagnetic energy source (**100**) of any of claim 11 to claim 15, wherein the hub is further configured to transmit an optical cable identification to the processor (**170**).

17. The electromagnetic energy source (**100**) of any of claim 11 to claim 16, wherein the plurality of optical cable connectors (**140**) comprises a first optical cable connector and a second optical cable connector, wherein the plurality of electromagnetic energy emitters

(130) comprises a first electromagnetic energy emitter, and wherein the electromagnetic energy source (100) is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter and between the second optical cable connector and the first electromagnetic energy emitter during the same time interval.

18. The electromagnetic energy source (100) of any of claim 11 to claim 17, wherein the plurality of optical cable connectors (140) comprises a first optical cable connector and wherein the plurality of electromagnetic energy emitters (130) comprises a first electromagnetic energy emitter and a second electromagnetic energy emitter, and wherein the electromagnetic energy source (100) is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter during a first time interval and to provide optical communication between the first optical cable and the second electromagnetic energy emitter during a second time interval.

19. The electromagnetic energy source (100) of any of claim 11 to claim 18, wherein the plurality of optical cable connectors (140) comprises a first optical cable connector and wherein the plurality of electromagnetic energy emitters (130) comprises a first electromagnetic energy emitter and a second electromagnetic energy emitter, and wherein the electromagnetic energy source is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter and the second electromagnetic energy emitter during the same time interval.

20. The electromagnetic energy source of any of claim 11 to claim 19, further comprising an optical router.

21. A system for illumination of a vascular space, comprising;

an electromagnetic energy source (100) comprising a plurality of electromagnetic energy emitters (130);

a vascular access device (210), comprising a waveguide (230);

an optical cable (150), wherein the optical cable (150) is in optical communication with at least one of the plurality of electromagnetic energy sources (130) and the waveguide (230); and,

a processor (170); and

a database (180), wherein the processor (170) is communicatively coupled to the database (180), wherein the database (180) comprises data related to a

calibration of at least one of the plurality of electromagnetic energy sources (**130**),and is configured to modulate the optical communication between at least one of the plurality of electromagnetic energy emitters (**130**) and the optical cable (**150**) based upon instructions stored in the database (**180**).

22. The system of claim 21, further comprising a plurality of optical cables (**150**) and a plurality of vascular access devices (**210**).

23. The system of claim 21, further comprising an optical calibrator (**240**).

24. The system of claim 23, further comprising a calibration port (**160**), wherein calibration port (**160**) is configured to provide optical communication between the optical calibrator (**240**) and at least one of the plurality of electromagnetic energy emitters (130).

25. The system of any of claim 21 to 24, wherein the optical cable (**150**) is configured to provide optical communication between the optical calibrator (**240**) and at least one of the plurality of electromagnetic energy emitters (**130**).

26. The system of any of claim 21 to 25, wherein the vascular access device (**210**) further comprises a catheter, wherein at least a portion of the waveguide (**230**) lies within a lumen of the catheter, such that the waveguide (**230**) is entirely enclosed within the vascular access device (**210**).

CLAIMS

1. Use of electromagnetic radiation for selectively damaging a cell or virus in a vascular space and its contents, comprising;

providing a vascular access device comprising a waveguide, wherein at least a portion of the waveguide is within a vascular space;

transmitting a first illumination comprising a first electromagnetic radiation through the waveguide over a first time interval, wherein the first illumination induces a first effect within the vascular space, wherein the first effect comprises selective damage of a cell or a virus; and,

transmitting a second illumination comprising a second electromagnetic radiation through the waveguide over a second time interval, wherein the second illumination induces a second effect within the vascular space; and,

wherein the second effect at least partially reverses the first effect.

2. The use of claim 1, wherein the first electromagnetic radiation comprises an ultraviolet wavelength.

3. The use of claim 2, wherein the first electromagnetic radiation further comprises a light wavelength from 400nm to 1200nm.

4. The use of any of claim 1 to claim 3, wherein the second electromagnetic radiation comprises a light wavelength range of 520nm to 540nm.

5. The use of claim 4, wherein the second electromagnetic radiation further comprises a light wavelength range of 620nm to 640nm.

6. The use of any of claim 1 to claim 5, wherein the first electromagnetic radiation comprises a plurality of light wavelength ranges, wherein at least one of the plurality of wavelengths is a member of the group consisting of UVA, UVB, and UVC.

7. The use of any claim 1 to claim 6, wherein the second electromagnetic radiation comprises a plurality of light wavelength ranges, including a light wavelength range of 520nm to 540nm.

8. The use of any of claim 1 to claim 7, wherein the first time interval exceeds 1 second.

9. The use of any of claim 1 to claim 8, wherein the second time interval exceeds 1 second.

10. The use of any of claim 1 to claim 9, comprising the additional step of delivering fluids to the vascular space through the vascular access device.

11. An electromagnetic energy source (**100**) for illumination of a vascular space, comprising;

a plurality electromagnetic energy emitters (**130**);

one or more optical cable connectors (**140**), wherein the optical cable connector (**140**) is in optical communication with at least one of the plurality of electromagnetic energy sources (**130**);

one or more optical cables (**150**), comprising a hub that is configured to provide an optical interface with the optical cable connectors;

a processor (**170**), wherein the processor (**170**) is configured to modulate optical communication between at least one of the plurality of electromagnetic energy emitters (**130**) and the optical cable connector (**140**); and

a database (**180**) that is communicatively linked to the processor (**170**), wherein the database (**180**) comprises one or more illumination protocols and wherein the illumination protocol comprises instructions for modulation of an electromagnetic energy emitter (**130**), and wherein the database (**180**) further comprises data related to a calibration of at least one of the plurality of electromagnetic energy sources (**130**).

12. The electromagnetic energy source (**100**) of claim 11, wherein the processor (**170**) is configured to modify a base illumination protocol based upon data stored in the database (**180**) to generate a modified illumination protocol.

13. The electromagnetic energy source (**100**) of claim 11 or claim 12, further comprising a mount configured to affix the electromagnetic energy source to a pole.

14. The electromagnetic energy source (100) of any of claim 11 to claim 13, further comprising a calibration port (**160**).

15. The electromagnetic energy source (**100**) of any of claim 11 to claim 14, wherein the hub is further configured to transmit an optical cable identification to the processor (**170**).

16. The electromagnetic energy source (**100**) of any of claim 11 to claim 15, wherein the plurality of optical cable connectors (**140**) comprises a first optical cable connector and a second optical cable connector, wherein the plurality of electromagnetic energy emitters

(**130**) comprises a first electromagnetic energy emitter, and wherein the electromagnetic energy source (**100**) is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter and between the second optical cable connector and the first electromagnetic energy emitter during the same time interval.

17. The electromagnetic energy source (**100**) of any of claim 11 to claim 16, wherein the plurality of optical cable connectors (**140**) comprises a first optical cable connector and wherein the plurality of electromagnetic energy emitters (**130**) comprises a first electromagnetic energy emitter and a second electromagnetic energy emitter, and wherein the electromagnetic energy source (**100**) is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter during a first time interval and to provide optical communication between the first optical cable and the second electromagnetic energy emitter during a second time interval.

18. The electromagnetic energy source (**100**) of any of claim 11 to claim 17, wherein the plurality of optical cable connectors (**140**) comprises a first optical cable connector and wherein the plurality of electromagnetic energy emitters (**130**) comprises a first electromagnetic energy emitter and a second electromagnetic energy emitter, and wherein the electromagnetic energy source is configured to provide optical communication between the first optical cable connector and the first electromagnetic energy emitter and the second electromagnetic energy emitter during the same time interval.

19. The electromagnetic energy source of any of claim 11 to claim 18, further comprising an optical router.

20. A system for illumination of a vascular space, comprising;

an electromagnetic energy source (**100**) comprising a plurality of electromagnetic energy emitters (**130**);

a vascular access device (**210**), comprising a waveguide (**230**);

an optical cable (**150**), wherein the optical cable (**150**) is in optical communication with at least one of the plurality of electromagnetic energy sources (**130**) and the waveguide (**230**); and,

a processor (**170**); and

a database (**180**), wherein the processor (**170**) is communicatively coupled to the database (**180**), wherein the database (**180**) comprises data related to a

calibration of at least one of the plurality of electromagnetic energy sources (**130**) and is configured to modulate the optical communication between at least one of the plurality of electromagnetic energy emitters (**130**) and the optical cable (**150**) based upon instructions stored in the database (**180**).

21. The system of claim 20, further comprising a plurality of optical cables (**150**) and a plurality of vascular access devices (**210**).

22. The system of claim 20, further comprising an optical calibrator (**240**).

23. The system of claim 22, further comprising a calibration port (**160**), wherein calibration port (**160**) is configured to provide optical communication between the optical calibrator (**240**) and at least one of the plurality of electromagnetic energy emitters (130).

24. The system of any of claim 20 to 23, wherein the optical cable (**150**) is configured to provide optical communication between the optical calibrator (**240**) and at least one of the plurality of electromagnetic energy emitters (**130**).

25. The system of any of claim 20 to 24, wherein the vascular access device (**210**) further comprises a catheter, wherein at least a portion of the waveguide (**230**) lies within a lumen of the catheter, such that the waveguide (**230**) is entirely enclosed within the vascular access device (**210**).