

CLAIMS

1. A system for performing intra-corporeal ultraviolet therapy, the system comprising:

an endotracheal tube (ETT); and

a light catheter comprising:

a light delivery portion comprising a set of LEDs positioned to emit light circumferentially outward;

a cooling tube comprising at least one opening; and

an ETT connector configured to connect to the ETT.
2. The system of claim 1, wherein a portion of each LED in the set of LEDs is in direct contact with the cooling tube.
3. The system of claim 1, wherein within the cooling tube, a coolant gas flows in a first direction towards the at least one opening and exits via the at least one opening, and flows backwards within the light catheter in a second direction opposite to the first direction.
4. The system of claim 1, further comprising a heat sink coupled to each LED in the set of LEDs.
5. The system of claim 1, wherein the set of LEDs emit peak wavelengths in the 340 – 349 nm range.
6. The system of claim 1, wherein the set of LEDs emit wavelengths between 320 nm and 410 with a peak wavelength in a range from 343 nm to 345 nm.
7. The system of claim 1, wherein the set of LEDs emit peak wavelengths in the 340 – 345 nm range.
8. The system of claim 1, wherein the ETT connector comprises a flap valve.
9. The system of claim 1, further comprising a compressor system comprising:

one or more processors;

an air compressor; and

a dual connector comprising an air connector and an electrical connector.

10. The system of claim 9, further comprising an umbilical tube comprising:

an air passageway;

electrical conductors;

a light catheter connector configured to connect to the light catheter; and

a compressor connector configured to connect to the compressor system.

11. The system of claim 10, further comprising a light source controller comprising:

one or more processors;

a memory;

a control system coupled to the memory comprising one or more processors, the control system configured to execute machine executable code to cause the set of LEDs to emit light for a specified duration and an intensity.

12. The system of claim 11, wherein the specified duration is at least 20 minutes, 40 minutes, or 60 minutes daily, for at least one, two, three, four or five days.

13. The system of claim 11, wherein the intensity comprises at least 1,100 microwatt/cm², 1,500 microwatt/cm², 2,000 microwatt/cm², 2,100 microwatt/cm², 2,200 microwatt/cm², 2,300 microwatt/cm², 2,400 microwatt/cm², 2,500 microwatt/cm², 2,600 microwatt/cm², 2,700 microwatt/cm², 2,800 microwatt/cm², 2,900 microwatt/cm², 3,000 microwatt/cm², or 2 milliwatt/cm².

14. A method of deploying the light catheter in the system for performing intra-corporeal ultraviolet therapy of claim 11, the method comprising:

connecting the ETT connector to the ETT;

deploying the light catheter into the ETT by advancing the light catheter through the flap valve;

providing instructions to the controller to energize the set of LEDs; and

energizing the air compressor to pump air through the air passageway into the cooling tube and out of the at least one opening.

15. The method of claim 14, further comprising determining a temperature based on signals received from a thermistor in thermal contact with the light delivery portion and adjusting the flow rate of the air compressor based on the determined temperature.

16. The method of claim 14, further comprising determining a temperature based on signals received from a thermistor in thermal contact with the light delivery portion and adjusting the power to the LEDs delivered by the light source controller based on the determined temperature.

17. A method of treating a patient with a respiratory infection, the method comprising:

intubating the patient with an ETT;

connecting a light catheter to the ETT, wherein the light catheter comprises a set of LEDs and a cooling channel;

radiating UV-A light outwardly from the light catheter along a substantial length of the light catheter from the set of LEDs to treat an infection in the patient while ventilating the patient.

18. The method of claim 17, wherein the infection comprises at least one of pneumonia, a bacteria, a virus, an RNA virus, a coronavirus, or SARS-CoV-2.

19. The method of claim 17, wherein the radiating is performed for 20 minutes at 2,000 microWatt/cm² intensity.

20. The method of claim 17, wherein the radiating is performed using at least 1,000 microWatt/cm² intensity.

21. The method of claim 17, wherein the infection is SARS-CoV-2 and the radiating is performed for at least 20 minutes daily, for at least five days.
22. The method of claim 17, wherein radiating is performed for at least 10 minutes and between 1,000 – 5,000 microWatt/cm² intensity.
23. The method of claim 17, wherein radiating the light outwardly from the ETT is performed using a UV light source integrated in a catheter, introduced inside a canal in the ETT.