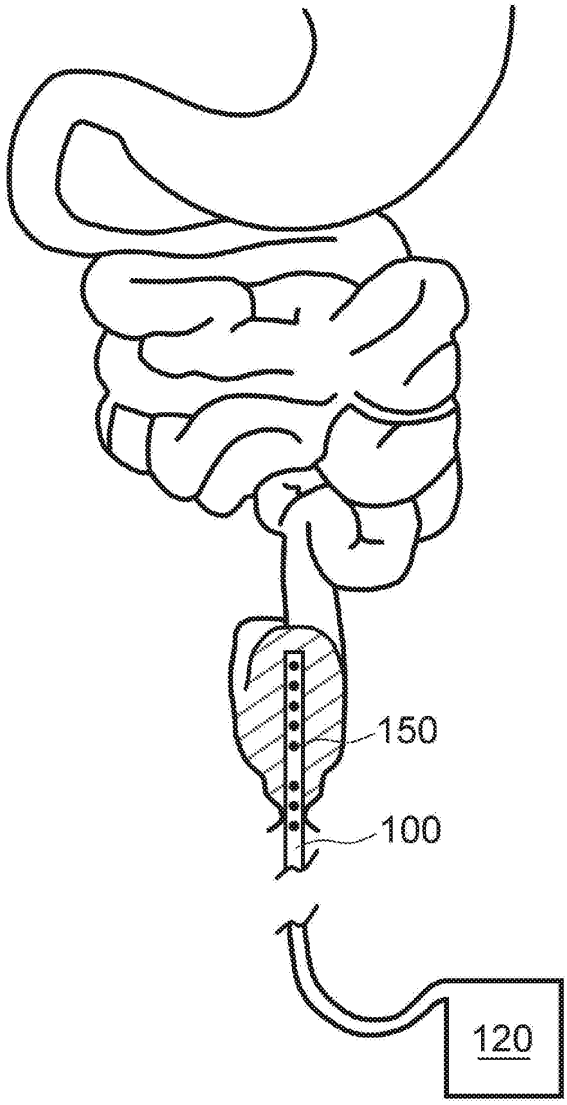


FIG. 1A

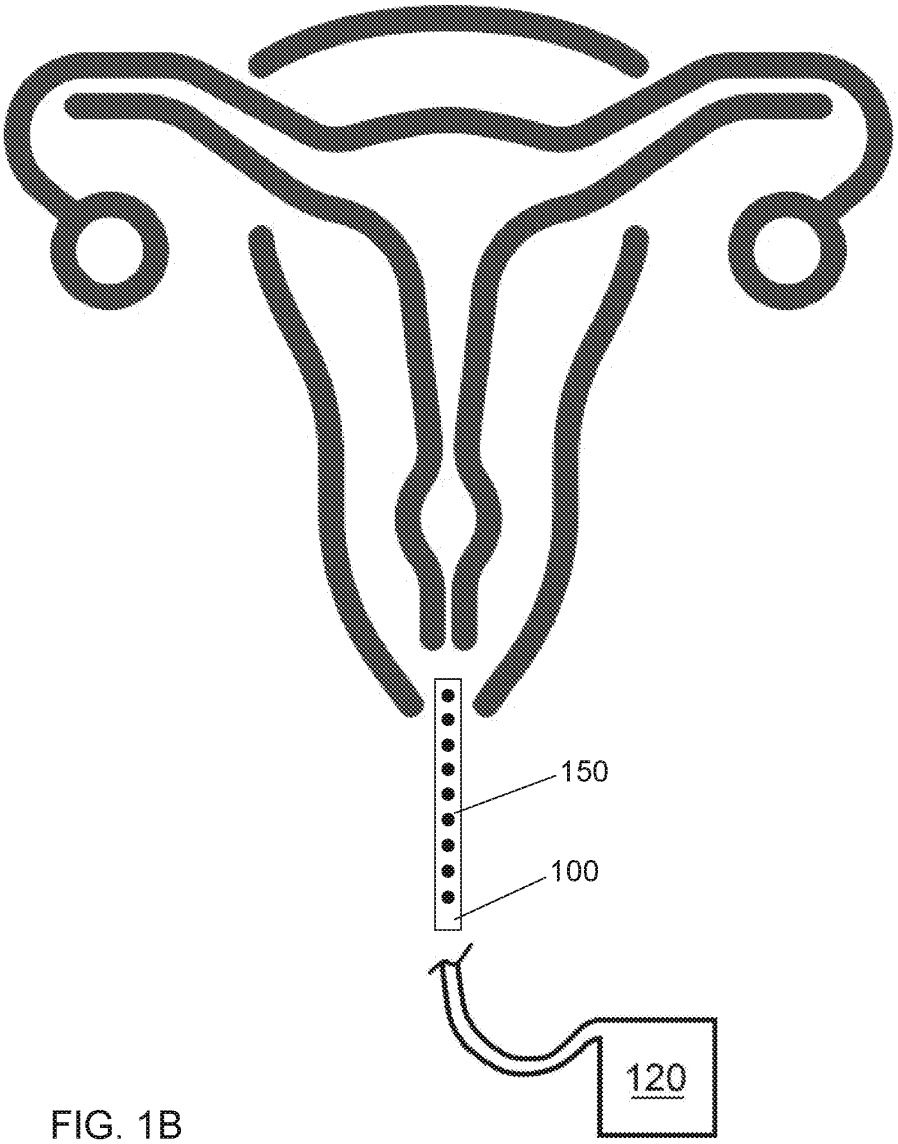


FIG. 1B

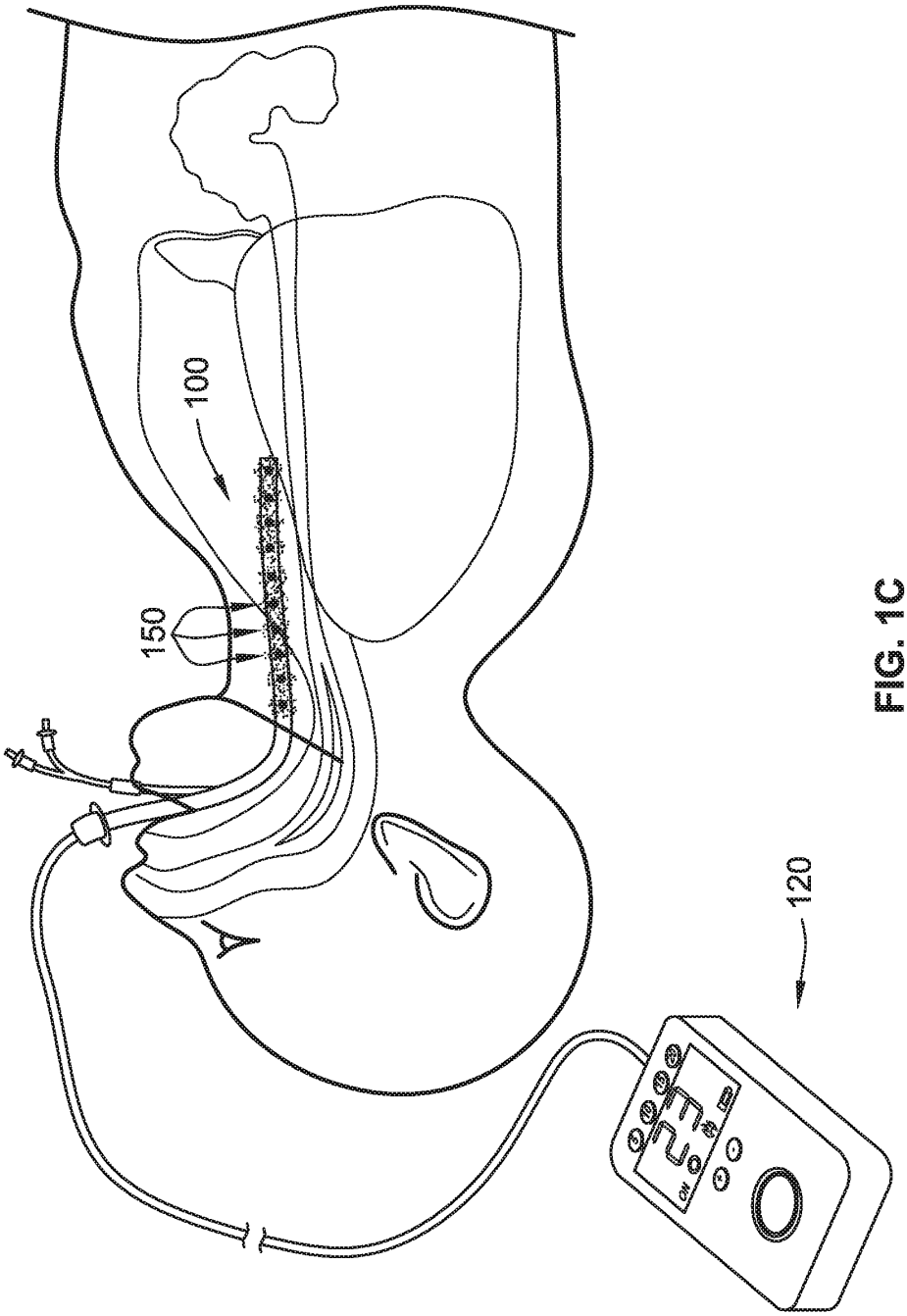


FIG. 1C

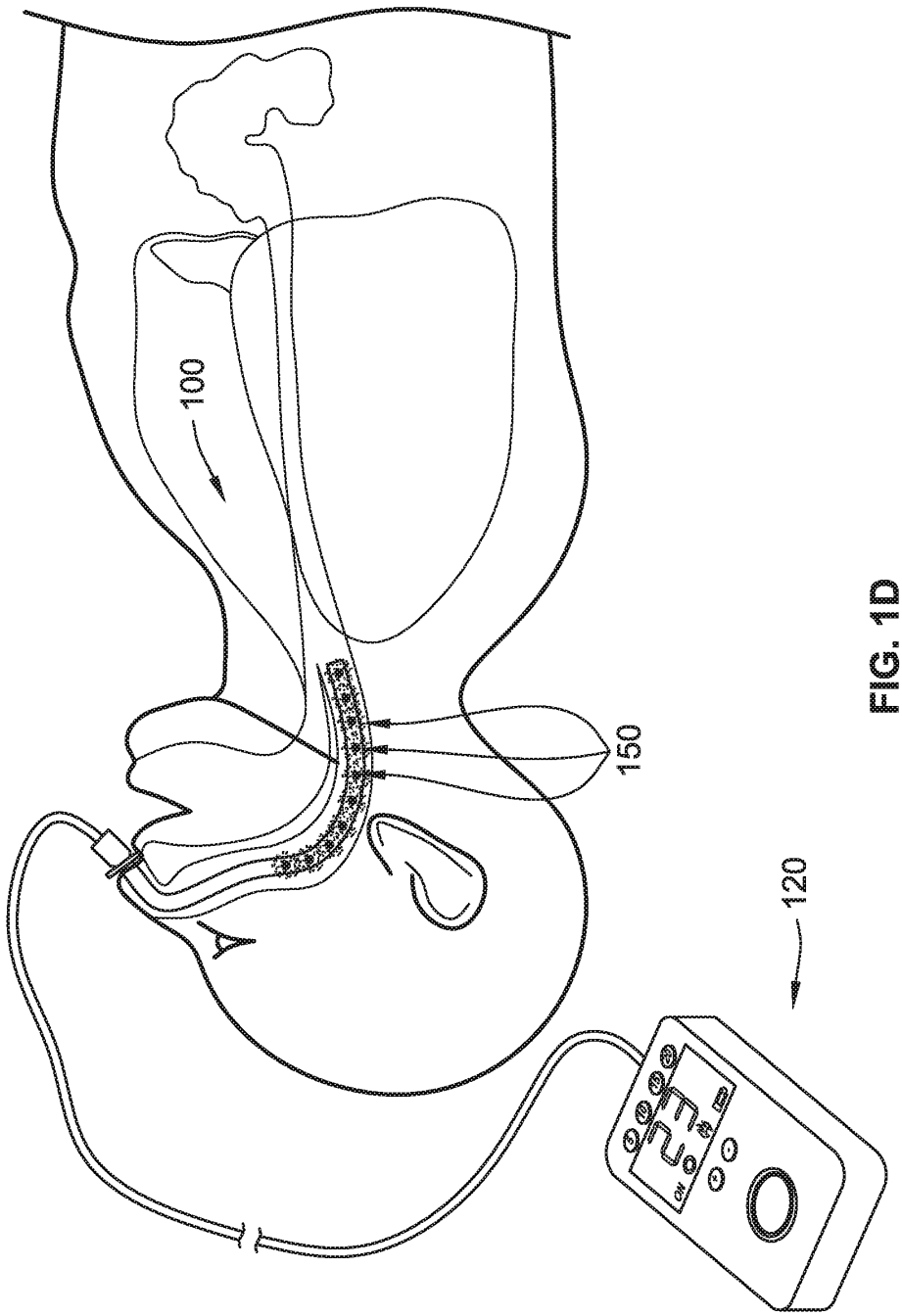


FIG. 1D

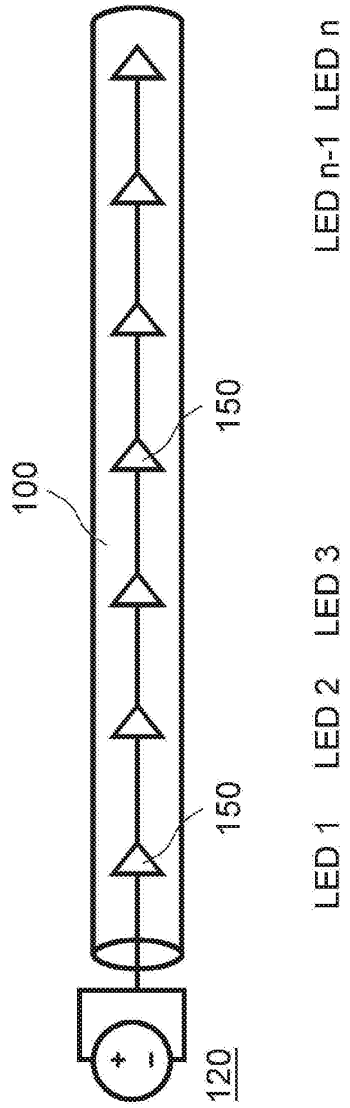


FIG. 2

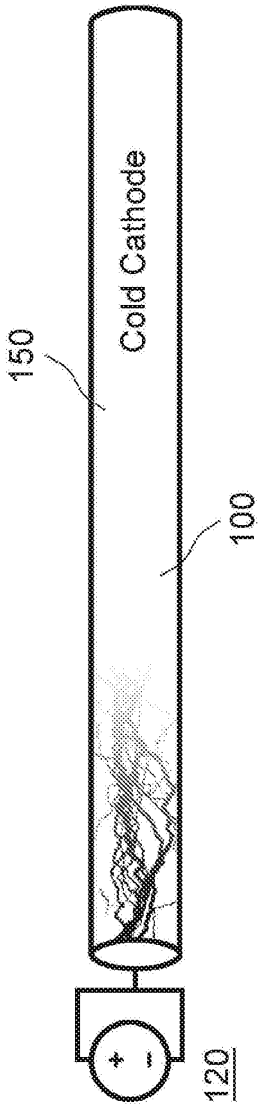


FIG. 3

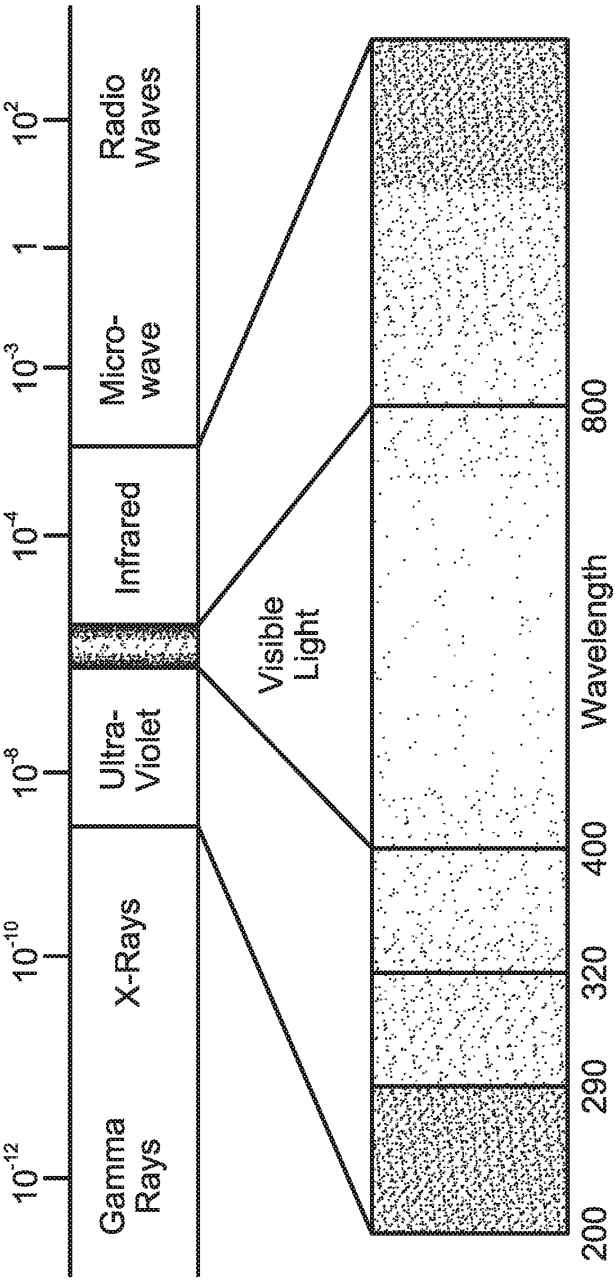

Gamma Rays
X-Rays
Ultra-Violet
Visible Light
Infrared
Micro-wave
Radio Waves
10^{-12}
10^{-10}
10^{-8}
10^{-4}
10^{-3}
1
10^{2}
200
290
320
400
800
Wavelength

FIG. 4

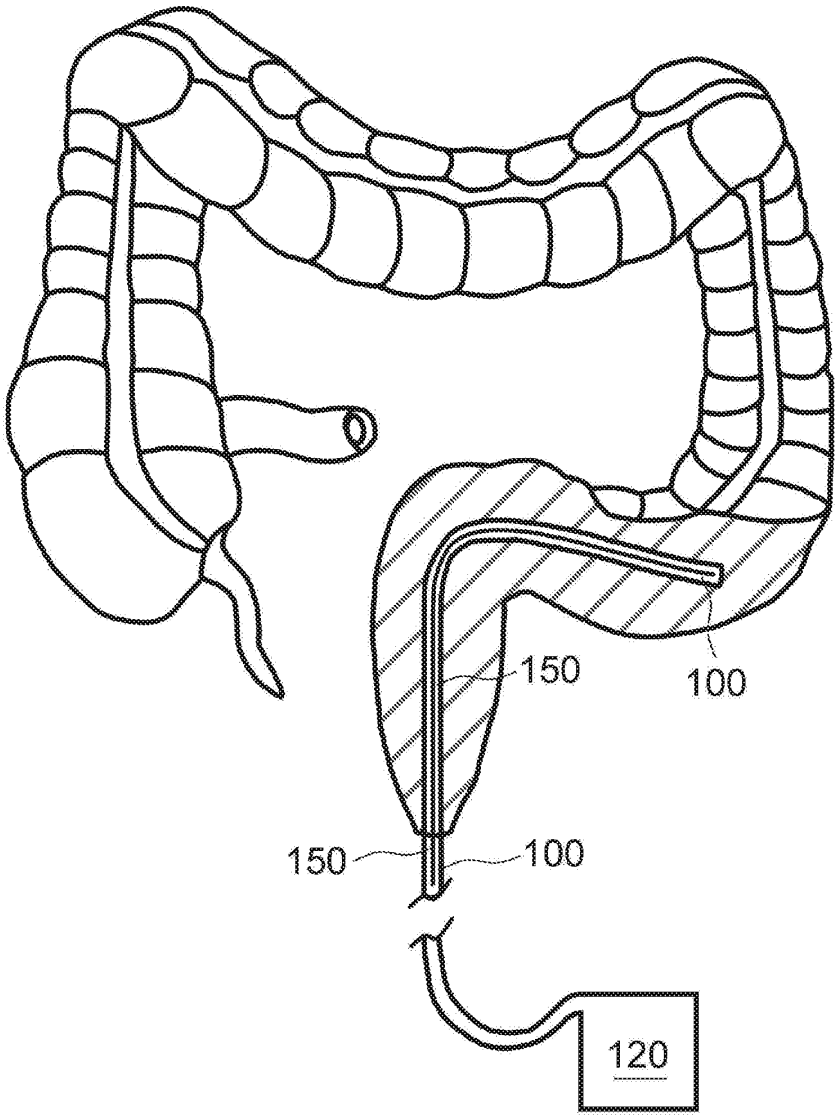


FIG. 5

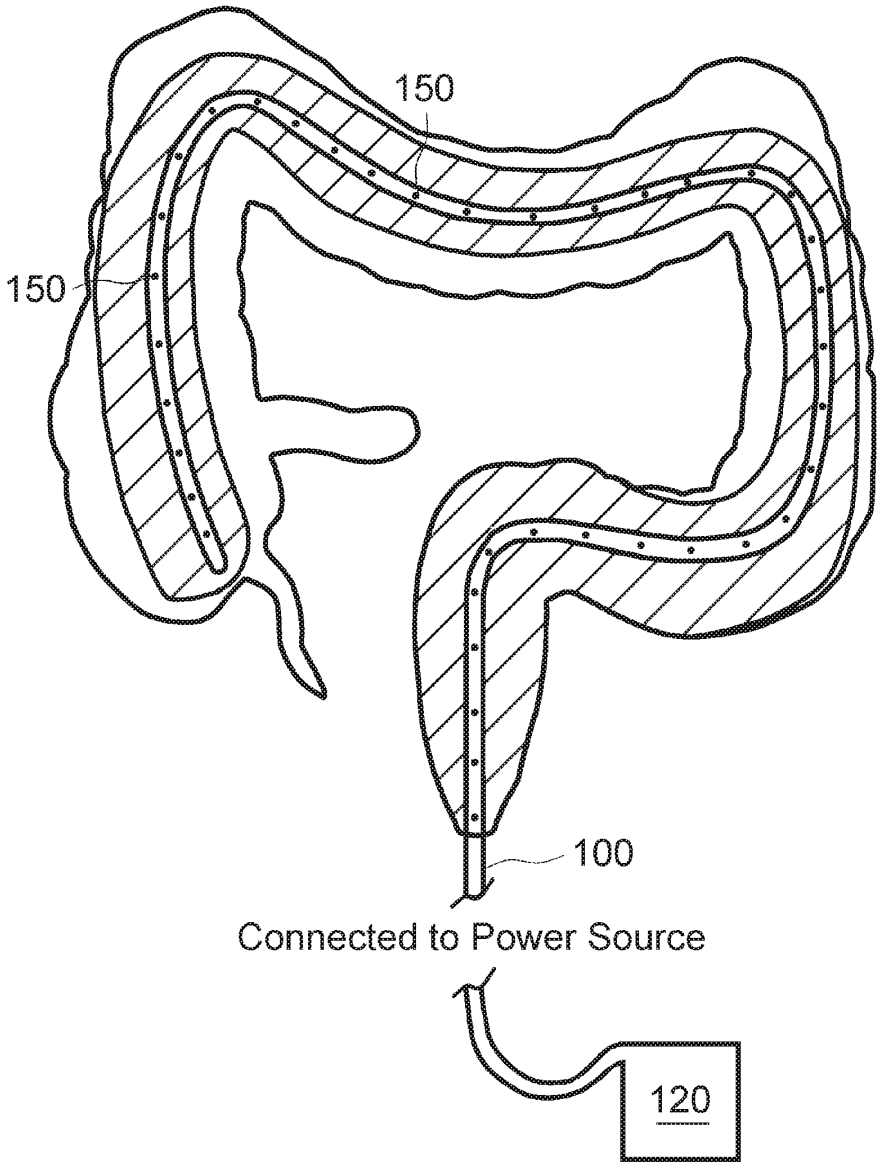


FIG. 6

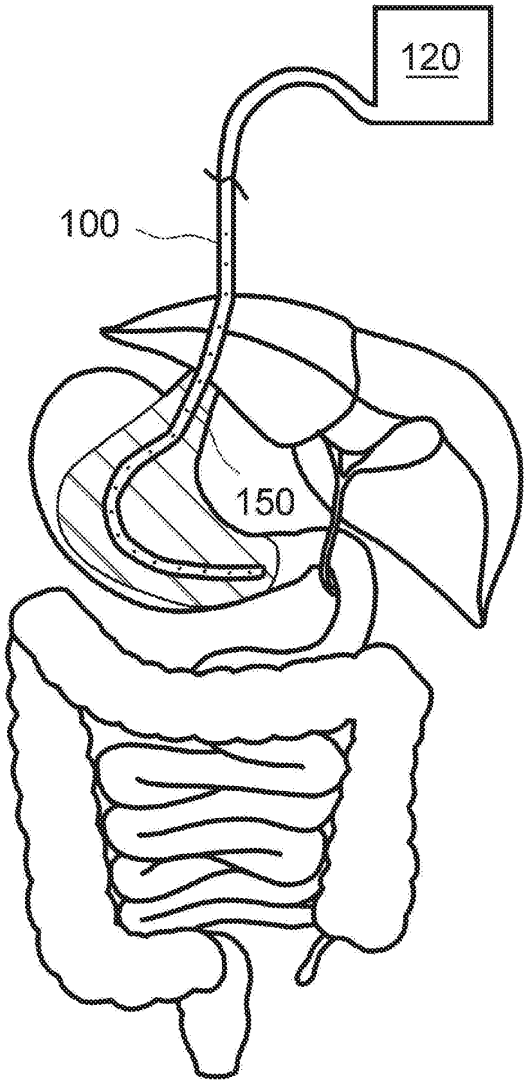


FIG. 7

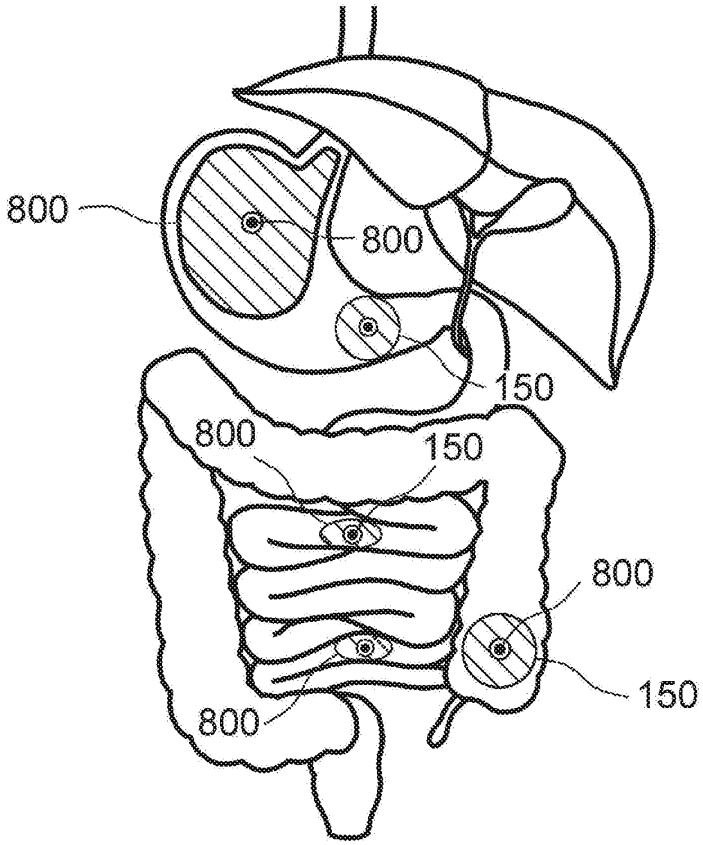


FIG. 8

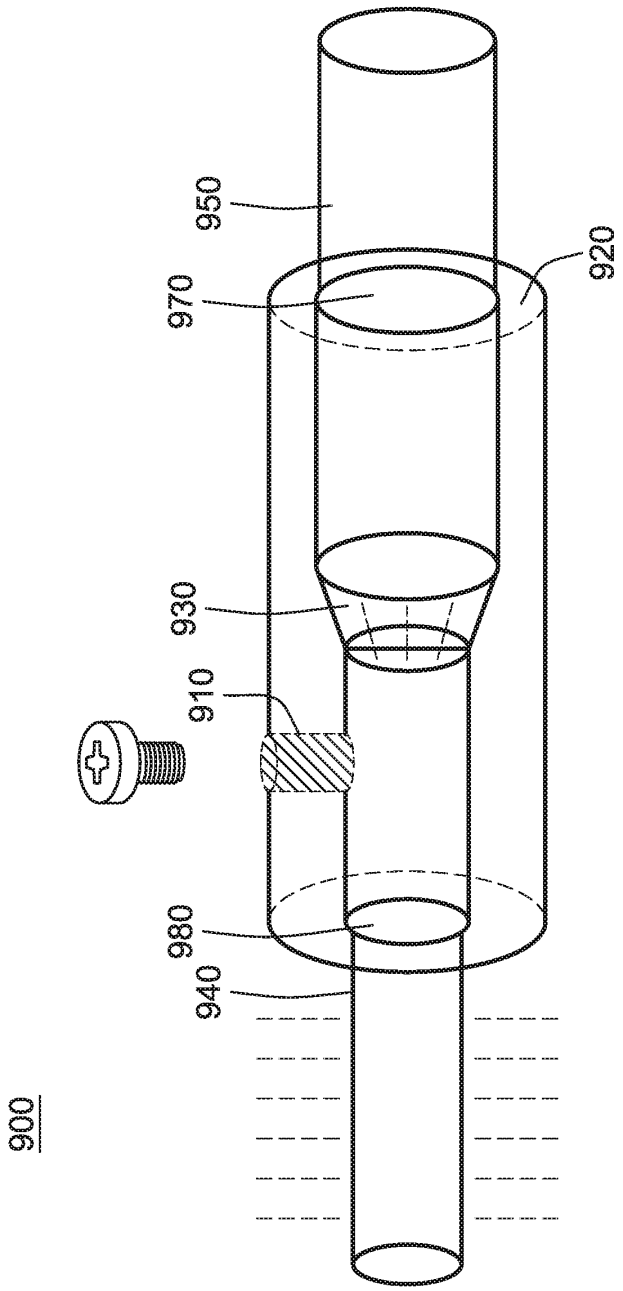


FIG. 9

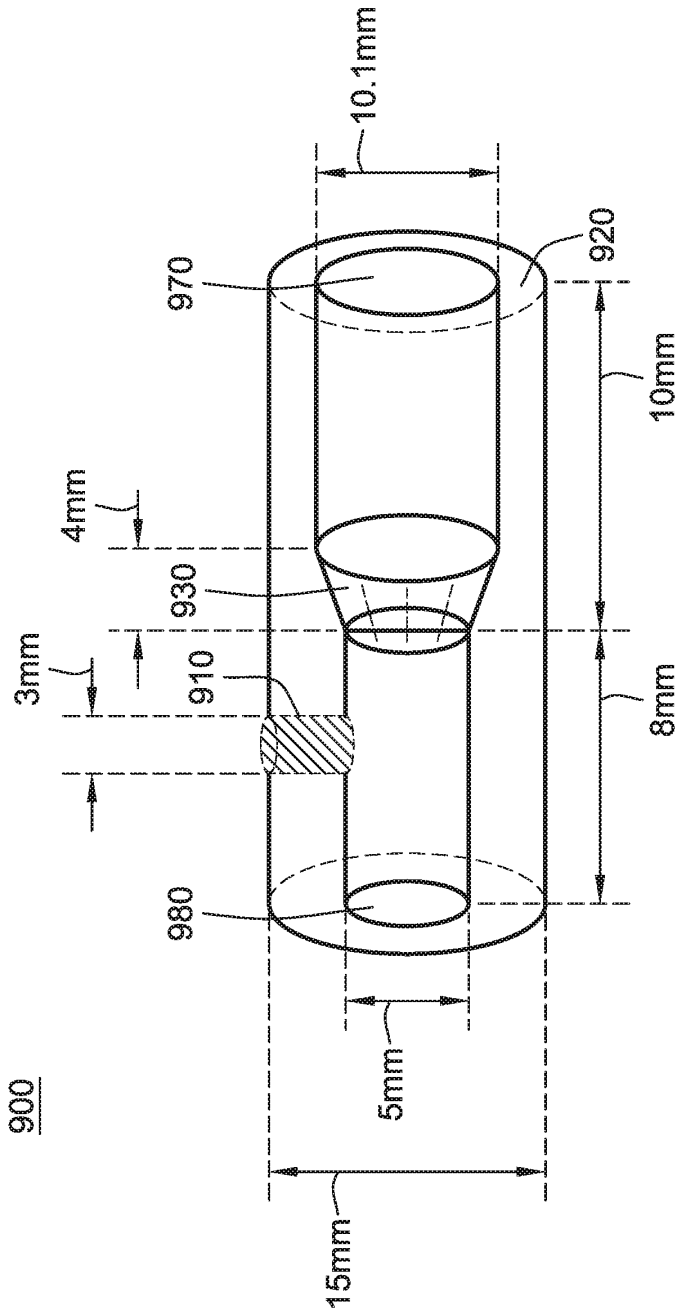


FIG. 10

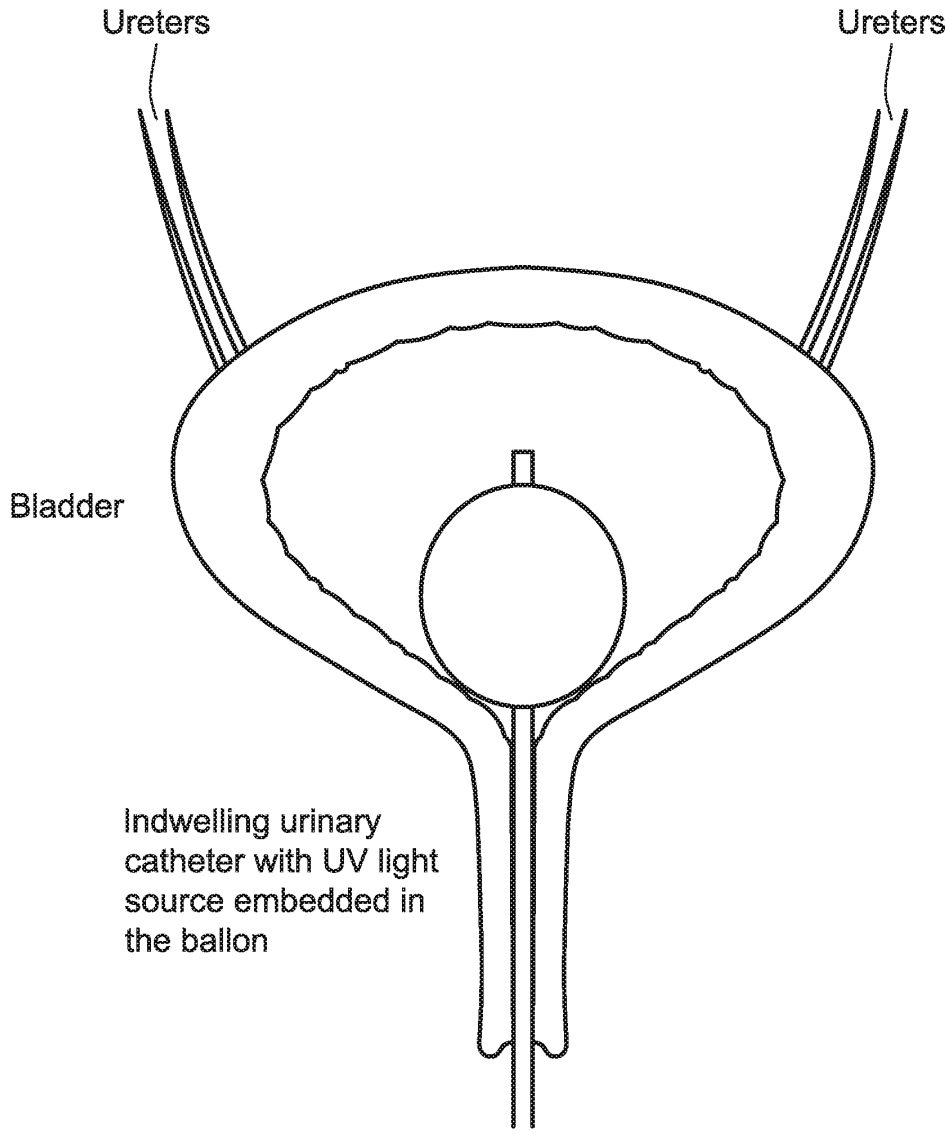

Ureters
Ureters
Bladder
Indwelling urinary catheter with UV light source embedded in the ballon

FIG. 11

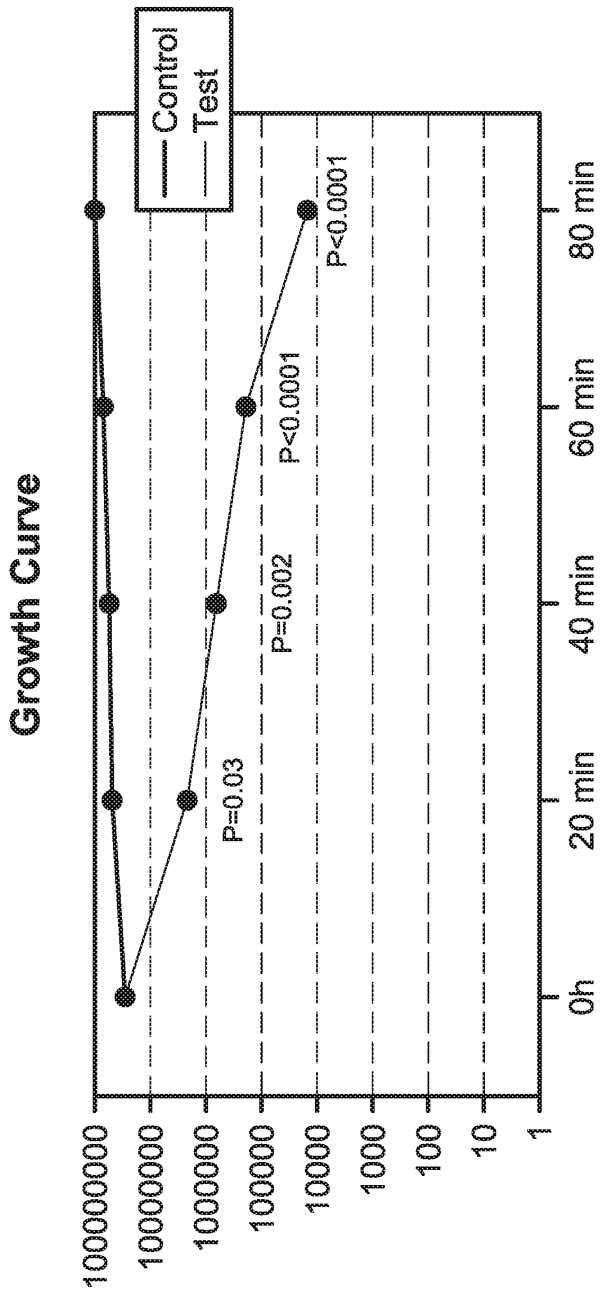

Growth Curve
Control
Test
100000000
10000000
1000000
100000
10000
1000
100
10
1
0h
20 min
40 min
60 min
80 min
P=0.03
P=0.002
P<0.0001
P<0.0001

FIG. 12A

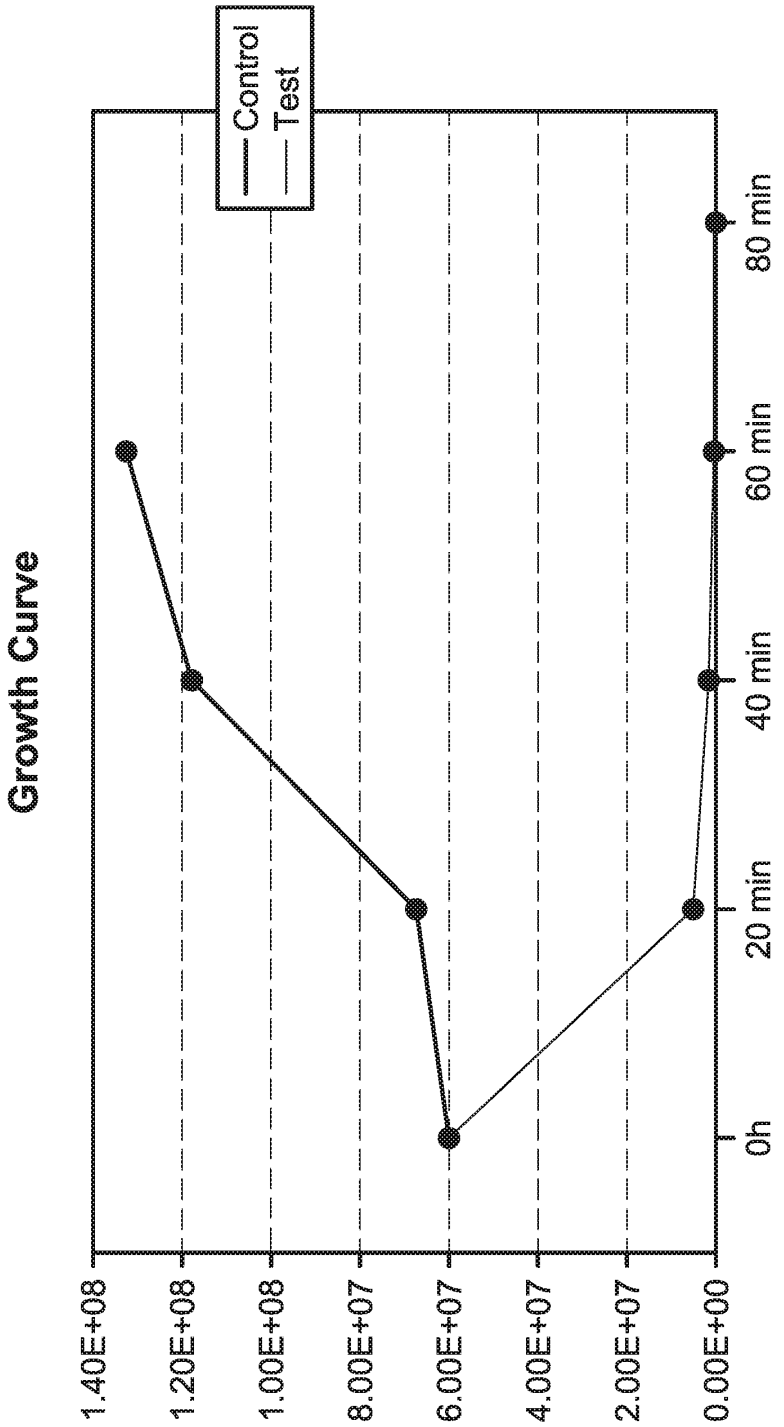

Growth Curve
Control
Test
1.40E+08
1.20E+08
1.00E+08
8.00E+07
6.00E+07
4.00E+07
2.00E+07
0.00E+00
0h
20 min
40 min
60 min
80 min

FIG. 12B

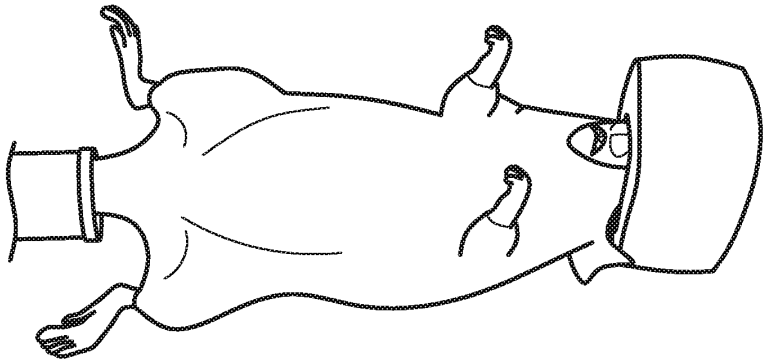


FIG. 13

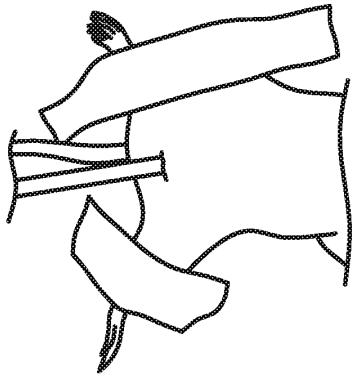


FIG. 14A



FIG. 14B

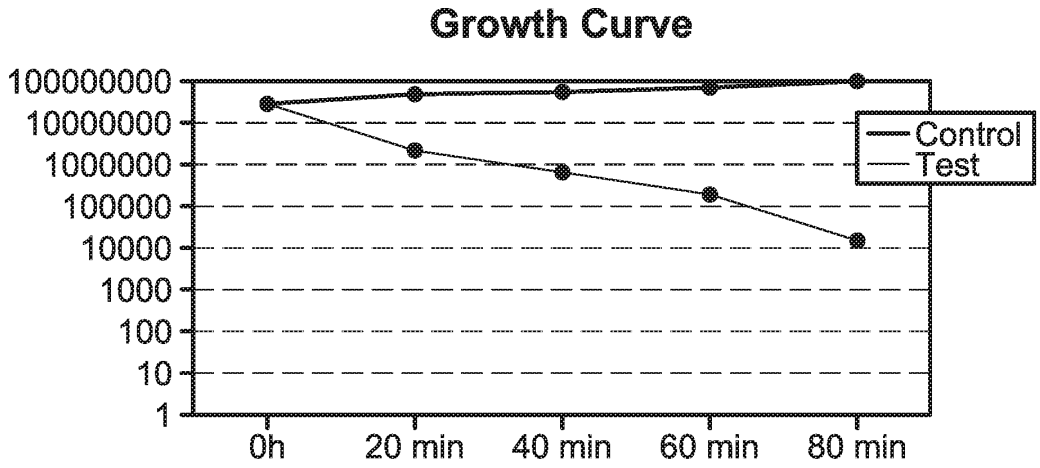


FIG. 15A

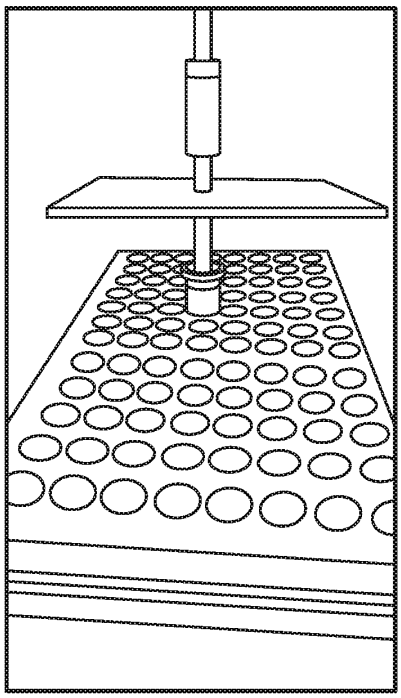


FIG. 15B

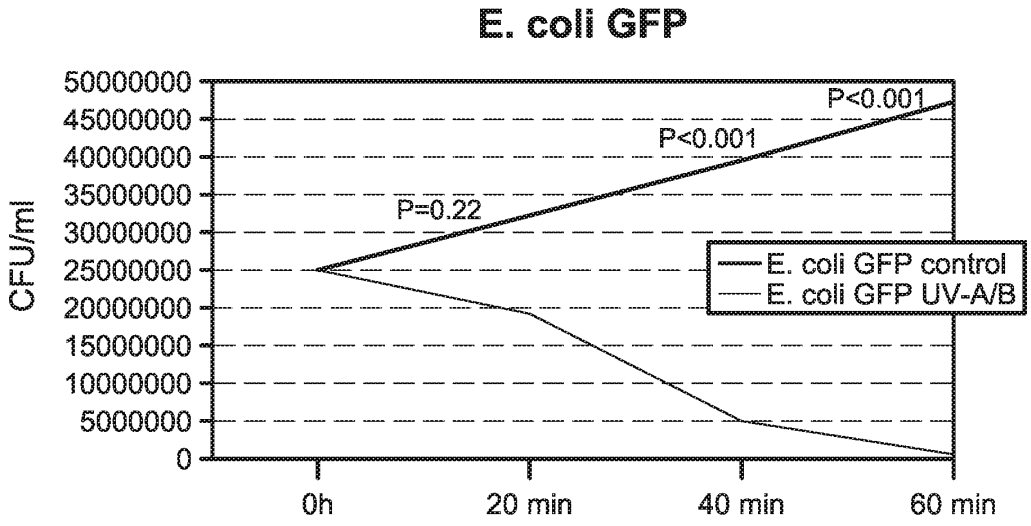

E. coli GFP
CFU/ml
50000000
45000000
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
0h
20 min
40 min
60 min
P=0.22
P<0.001
P<0.001
E. coli GFP control
E. coli GFP UV-A/B

FIG. 16

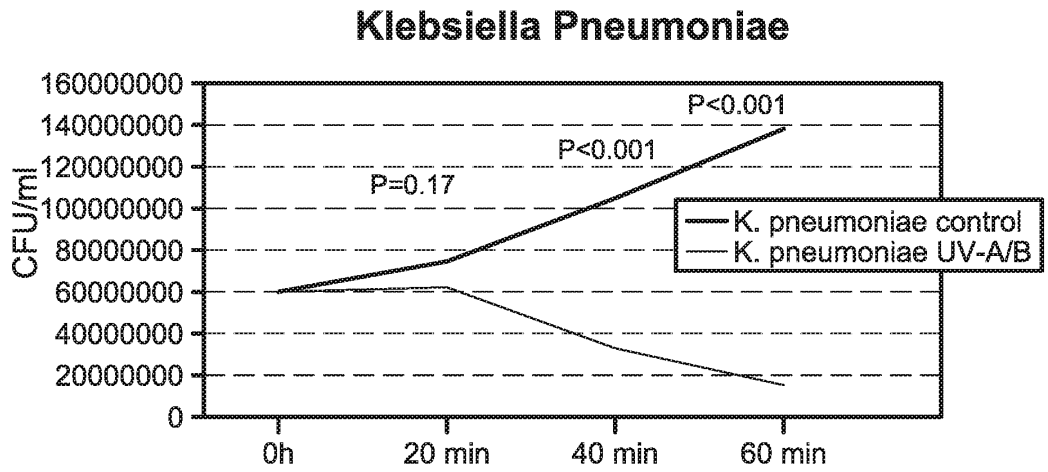


FIG. 17A

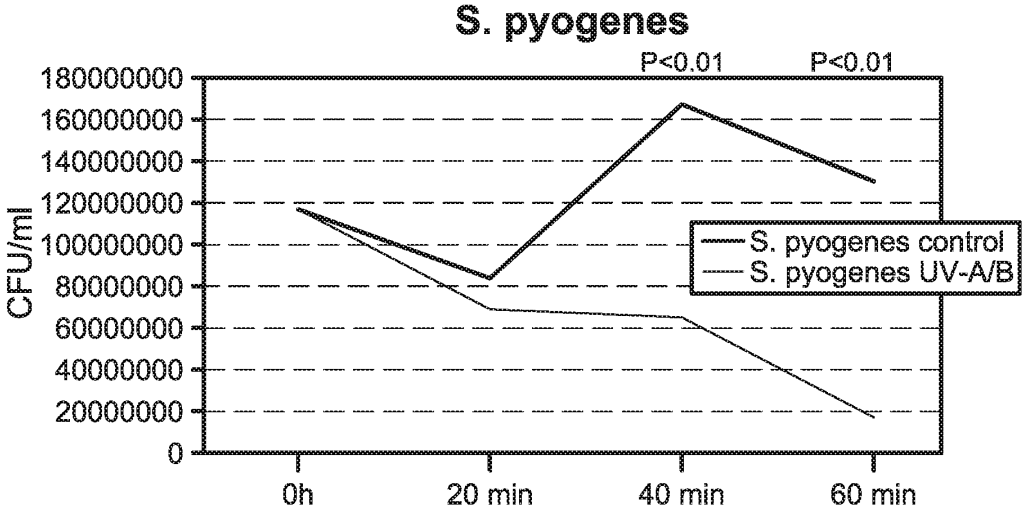


FIG. 17B

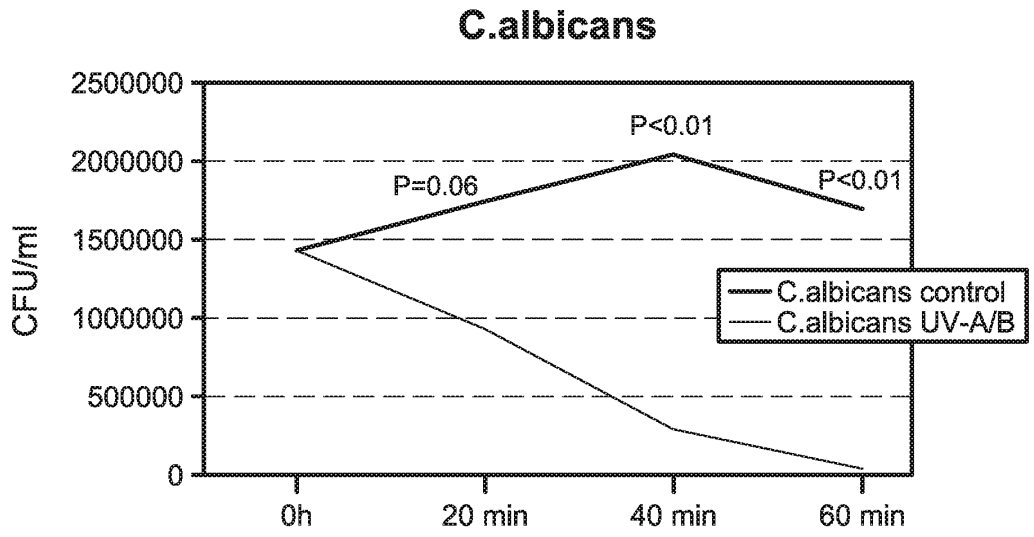

C.albicans
2500000
2000000
1500000
1000000
500000
0
CFU/ml
P=0.06
P<0.01
P<0.01
C.albicans control
C.albicans UV-A/B
0h
20 min
40 min
60 min

FIG. 18

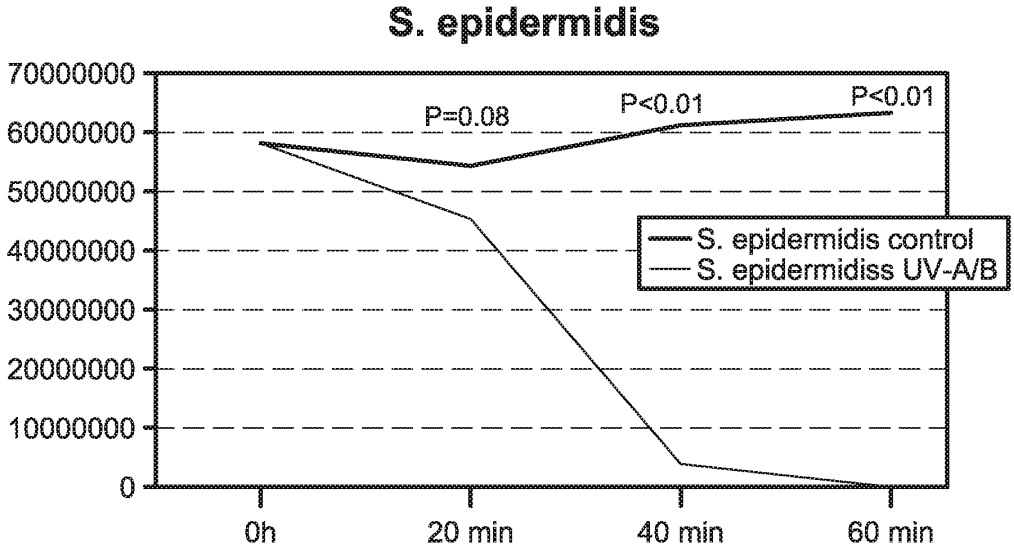

S. epidermidis
70000000
60000000
50000000
40000000
30000000
20000000
10000000
0
P=0.08
P<0.01
P<0.01
S. epidermidis control
S. epidermidiss UV-A/B
0h
20 min
40 min
60 min

FIG. 19

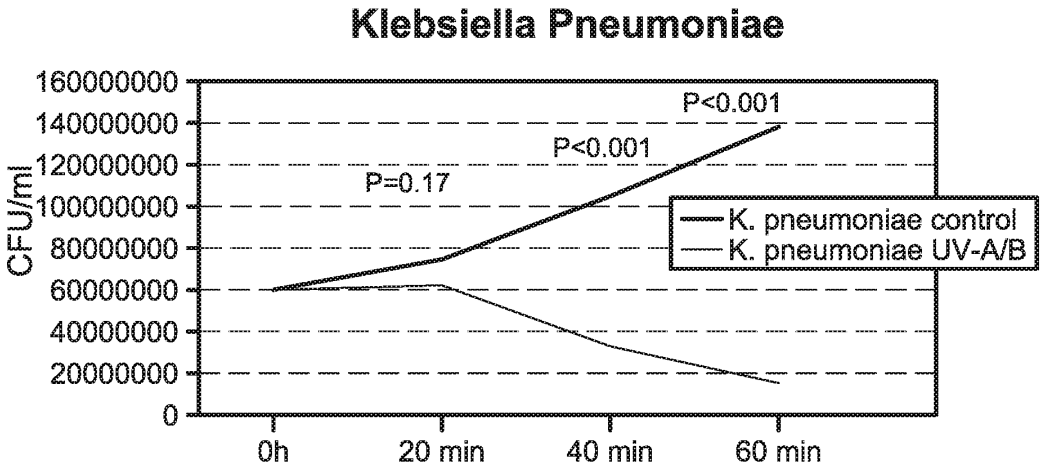

Klebsiella Pneumoniae
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
CFU/ml
P<0.001
P<0.001
P=0.17
K. pneumoniae control
K. pneumoniae UV-A/B
0h
20 min
40 min
60 min

FIG. 20

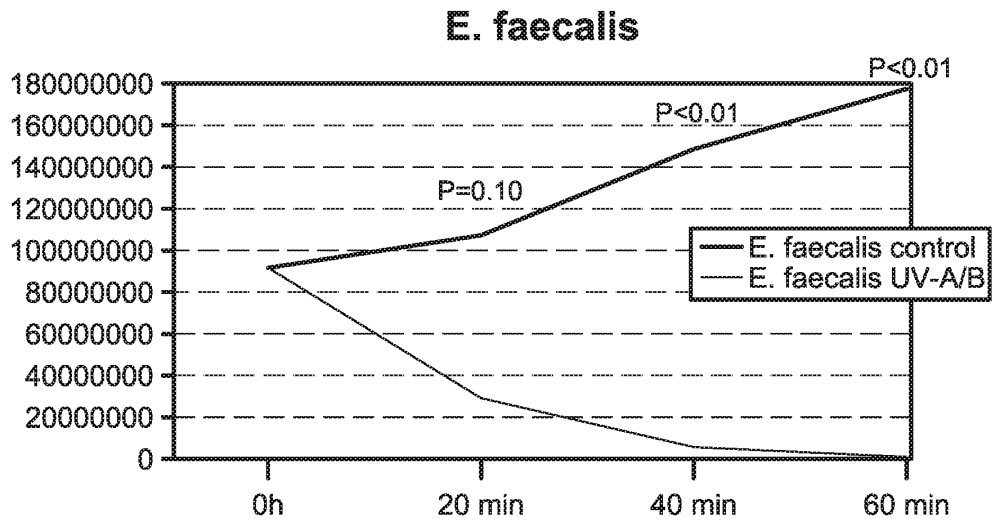


FIG. 21A

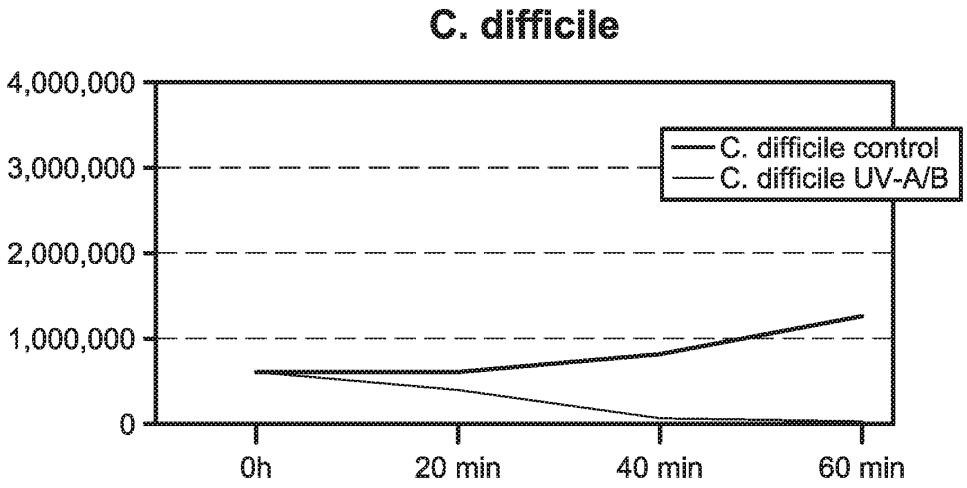


FIG. 21B

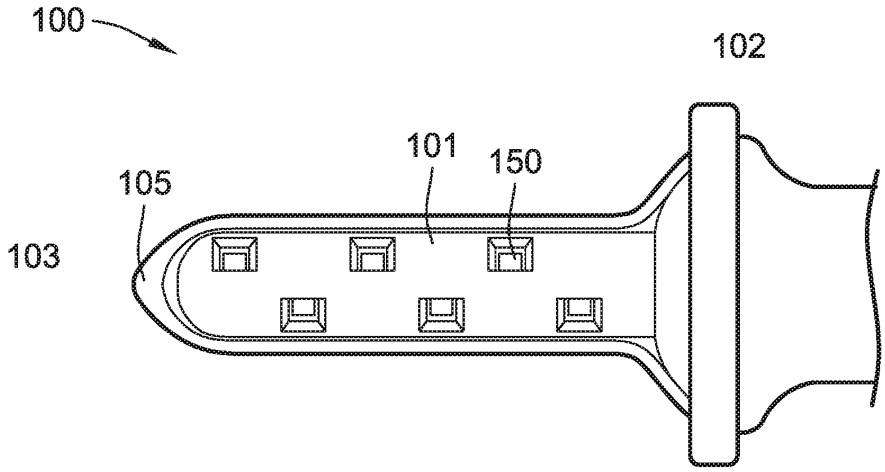

100
102
101
150
105
103

FIG. 22

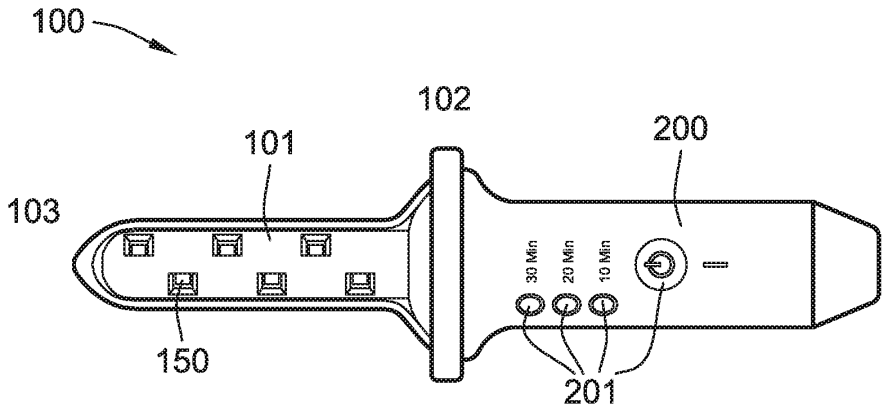

100
102
101
200
103
30 Min
20 Min
10 Min
150
201

FIG. 23

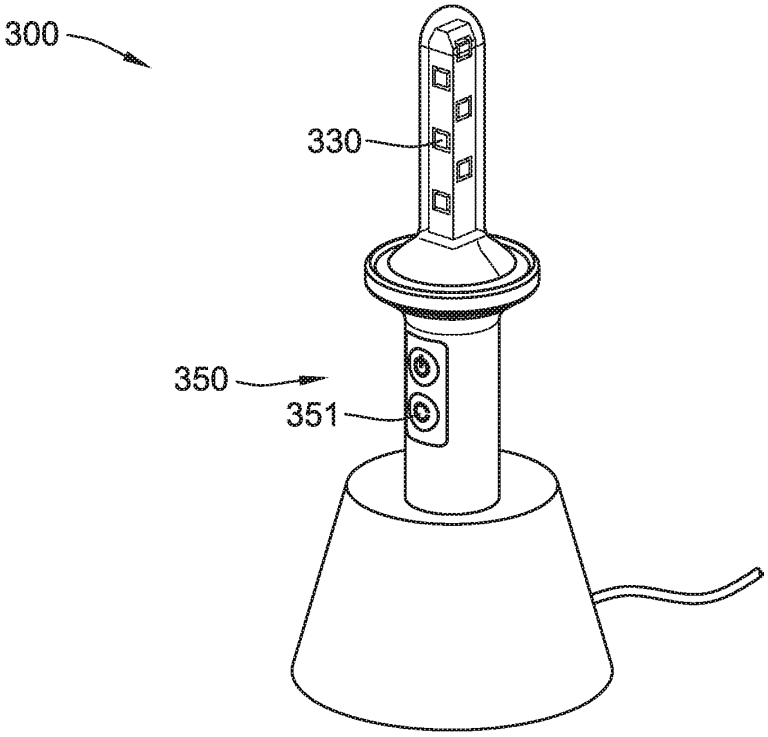


FIG. 24

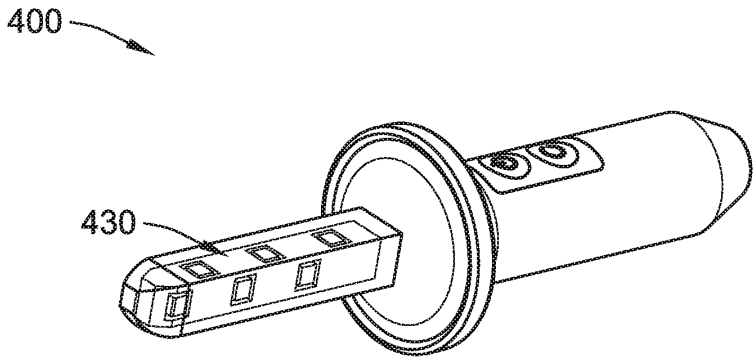


FIG. 25

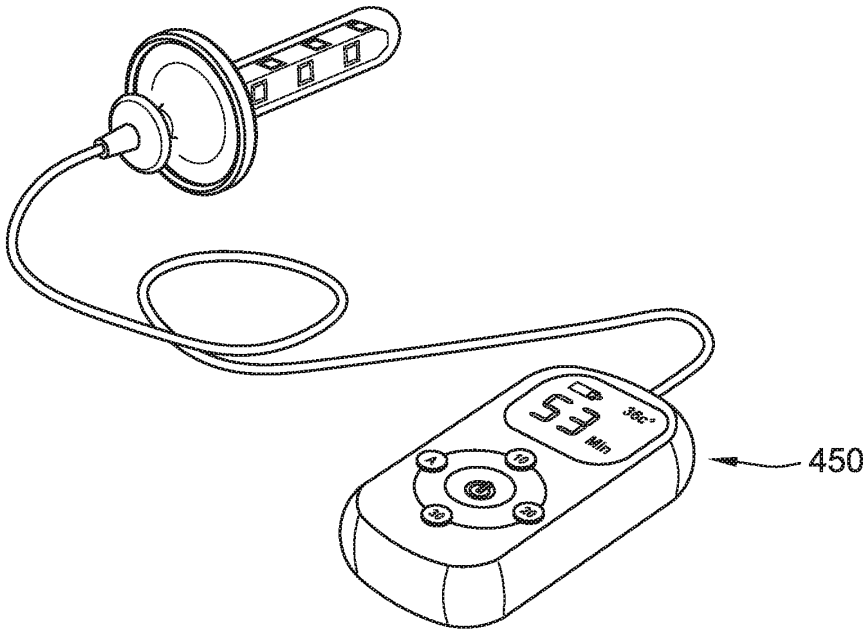


FIG. 26

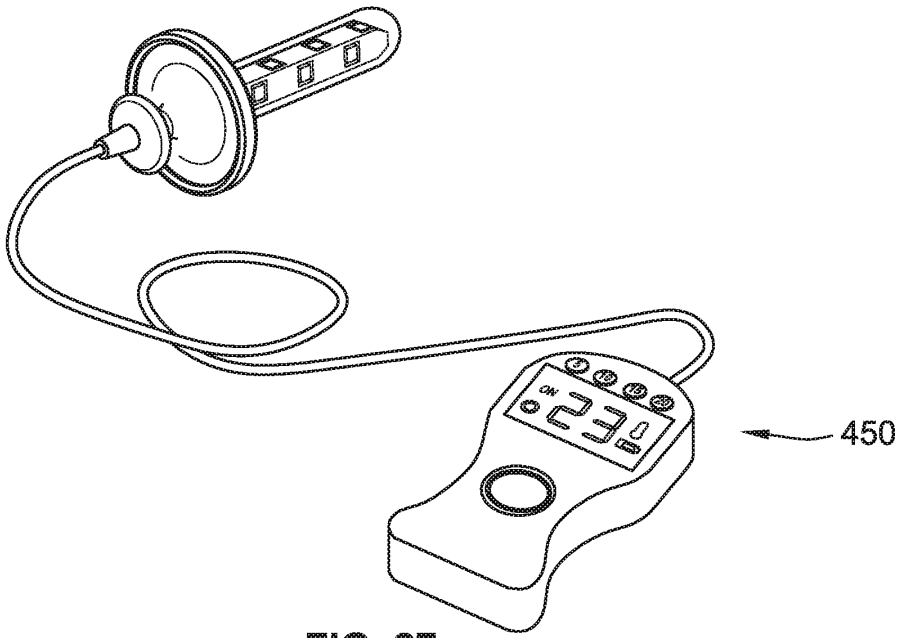


FIG. 27

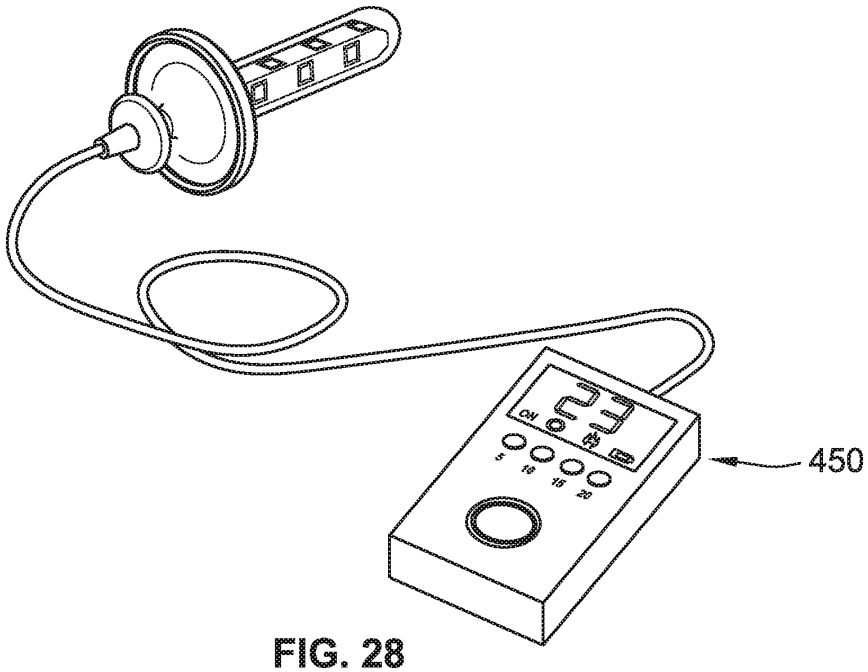


FIG. 28

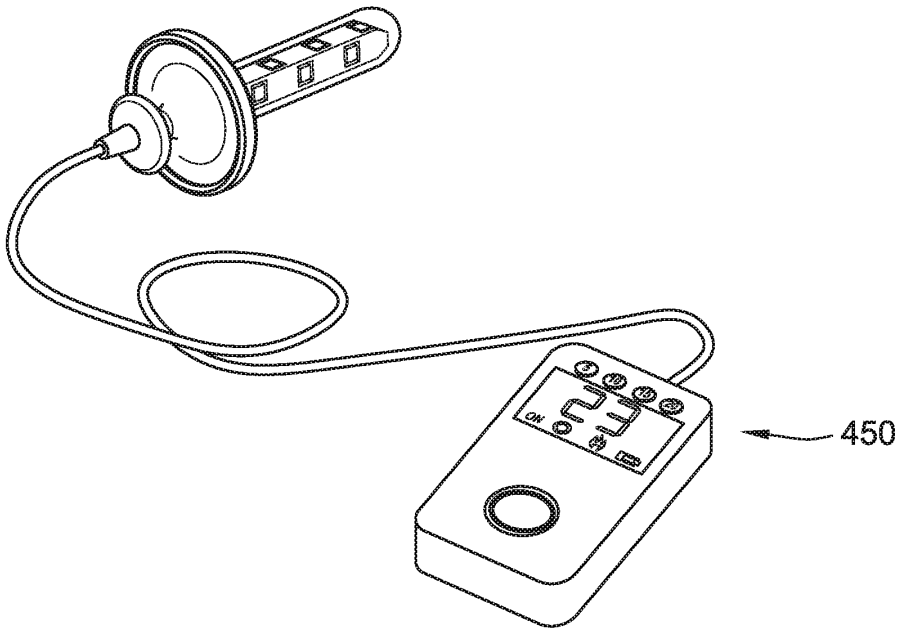


FIG. 29

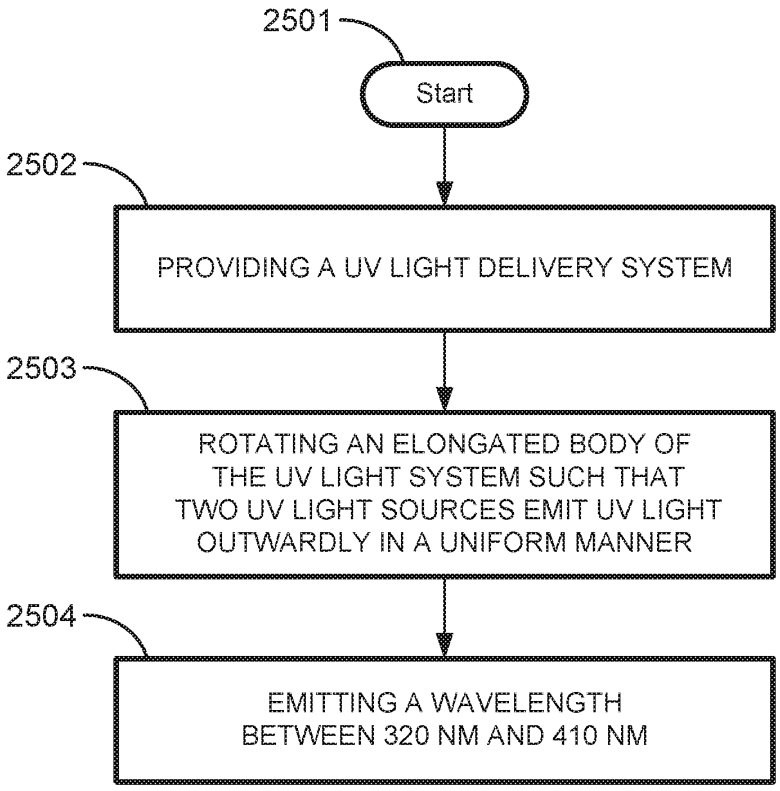

2501
Start
2502
PROVIDING A UV LIGHT DELIVERY SYSTEM
2503
ROTATING AN ELONGATED BODY OF THE UV LIGHT SYSTEM SUCH THAT TWO UV LIGHT SOURCES EMIT UV LIGHT OUTWARDLY IN A UNIFORM MANNER
2504
EMITTING A WAVELENGTH BETWEEN 320 NM AND 410 NM

FIG. 30

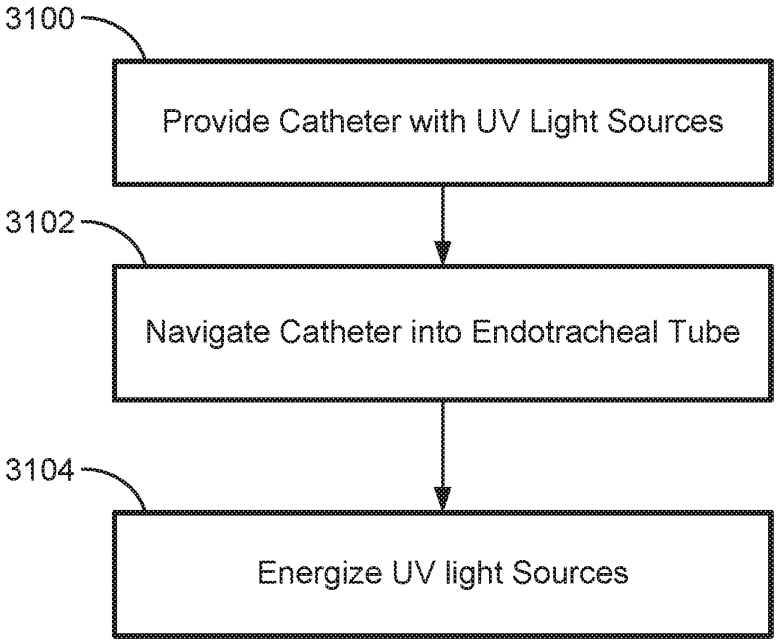

3100
Provide Catheter with UV Light Sources
3102
Navigate Catheter into Endotracheal Tube
3104
Energize UV light Sources

FIG. 31

Microbial strains	Liquid broth	Solid medium (agar-based plates)	Temperature of incubation °C	Atmosphere	Time of incubation Initial (hour)	Time of incubation Prior UVA exposure (hour)	Intensity of UVA light ($\mu W/cm^2$)	Time of UVA exposure (minutes)
Candida albicans (Robin) Berkhout ATCC® 10231™	Sabouraud Dextrose	Sabouraud Dextrose	24 to 26	Aerobic	16 to 24	4 to 6	1700	20, 40 and 60
Clostridioides difficile (Prevot) Lawson et al. ATCC® 700057™	Brain Heart Infusion	Reinforced Clostridial	36 to 37	Anaerobic	24 to 48	6 to 8	2000	20, 40 and 60
Enterococcus faecalis ATCC® 29212™	Brain Heart Infusion	Trypticase Soy Agar with 5% Sheep Blood	36 to 37	Aerobic	18 to 24	4 to 6	2400	20, 40 and 60
Escherichia coli GFP ATCC® 25922 GFP™	Luria Bertani	Luria Bertani	36 to 37	Aerobic	16 to 24	2 to 3	1300	20, 40 and 60
Escherichia coli - clinical isolate	Luria Bertani	Luria Bertani	36 to 37	Aerobic	16 to 24	2 to 3	1100 to 1300	20, 40, 60 and 80
Klebsiella pneumoniae ATCC® BAA-1705™	Luria Bertani	Luria Bertani	36 to 37	Aerobic	16 to 24	2 to 3	1300	20, 40 and 60
Proteus mirabilis ATCC® 29906™	Luria Bertani	Hectoen Enteric	36 to 37	Aerobic	16 to 24	2 to 3	2400	20, 40 and 60
Pseudomonas aeruginosa ATCC® 15442™	Luria Bertani	Luria Bertani	36 to 37	Aerobic	16 to 24	2 to 3	3500	20, 40 and 60
Staphylococcus epidermidis (Winslow and Winslow) Evans ATCC® 14990™	Tryptic Soy Broth	Trypticase Soy Agar with 5% Sheep Blood	36 to 37	Aerobic	24 to 48	3 to 5	2150	20, 40 and 60
Streptococcus pyogenes Rosenbach ATCC® 19615™	Tryptic Soy Broth	Trypticase Soy Agar with 5% Sheep Blood	36 to 37	Anaerobic	24 to 48	3 to 5	1800	20,40 and 60

Fig. 32

Microorganism	UVA Intensity (μW/cm²)	Group	Baseline CFUx10⁷/mL	20 min CFUx10⁷/mL	P value	40 min CFUx10⁷/mL	P value	60min CFUx10⁷/mL	P value
Clostridioides difficile	2,000	Exposed	0.1	0.08	0.01	0.01	0.003	0.0031	0.01
		Control	0.1	0.13		0.17		0.39	
Candida albicans	1,700	Exposed	0.14	0.09	0.007	0.03	0.001	0.0032	0.001
		Control	0.14	0.17		0.2		0.16	
Pseudomonas aeruginosa	3,500	Exposed	0.81	0.07	<0.001	No growth	<0.001	No growth	<0.001
		Control	0.81	0.61		0.93		0.85	
Klebsiella pneumoniae	1,300	Exposed	5.9	6.34	0.17	3.34	<0.001	1.53	<0.001
		Control	5.9	7.49		10.5		13.81	
Escherichia coli	1,300	Exposed	1.25	0.41	<0.001	0.21	0.001	0.03	<0.001
		Control	1.25	3.31		4.2		5.52	
Enterococcus faecalis	2,400	Exposed	9.21	2.99	0.1	0.61	0.01	0.08	0.01
		Control	9.21	10.6		14.72		17.74	
Streptococcus pyogenes	1,800	Exposed	1.17	0.68	0.64	0.64	0.001	0.17	0.004
		Control	1.17	0.83		1.68		1.31	
Proteus mirabilis	2,400	Exposed	0.62	No growth	<0.001	No growth	<0.001	No growth	<0.001
		Control	0.62	0.59		0.49		0.54	
Staphylococcus epidermidis	2,150	Exposed	0.57	0.43	0.01	0.03	<0.001	0.000117	<0.001
		Control	0.57	0.59		0.69		0.7	

Fig. 33

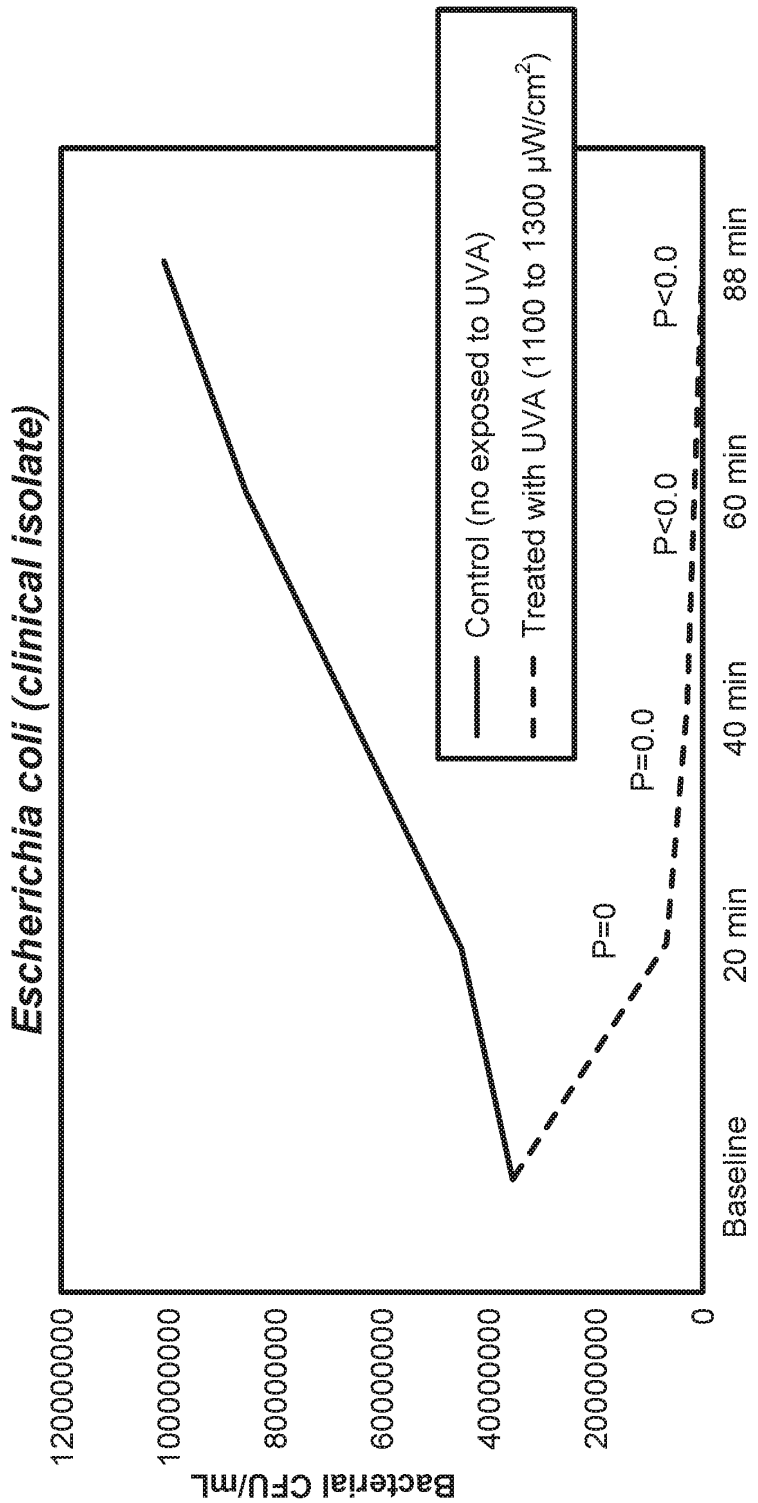

Escherichia coli (clinical isolate)
Bacterial CFU/mL
120000000
100000000
80000000
60000000
40000000
20000000
0
Baseline
20 min
40 min
60 min
88 min
Time of UVA exposure
Control (no exposed to UVA)
Treated with UVA (1100 to 1300 µW/cm2)
P=0
P=0.0
P<0.0
P<0.0

FIG. 34

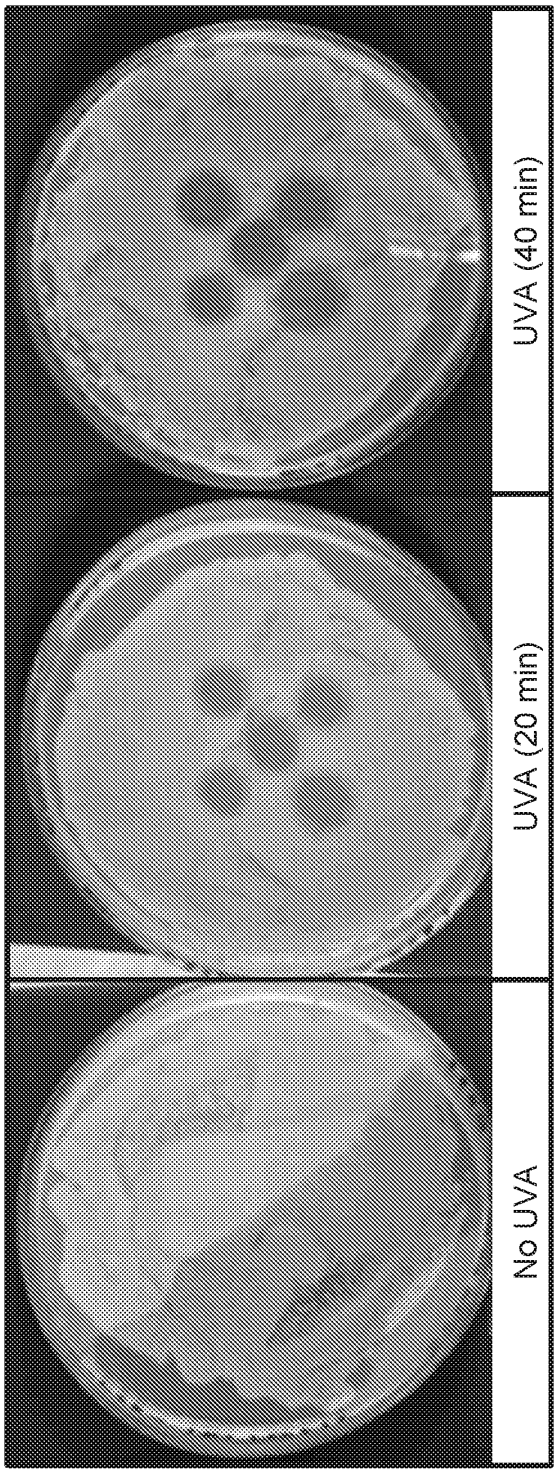


FIG. 35A

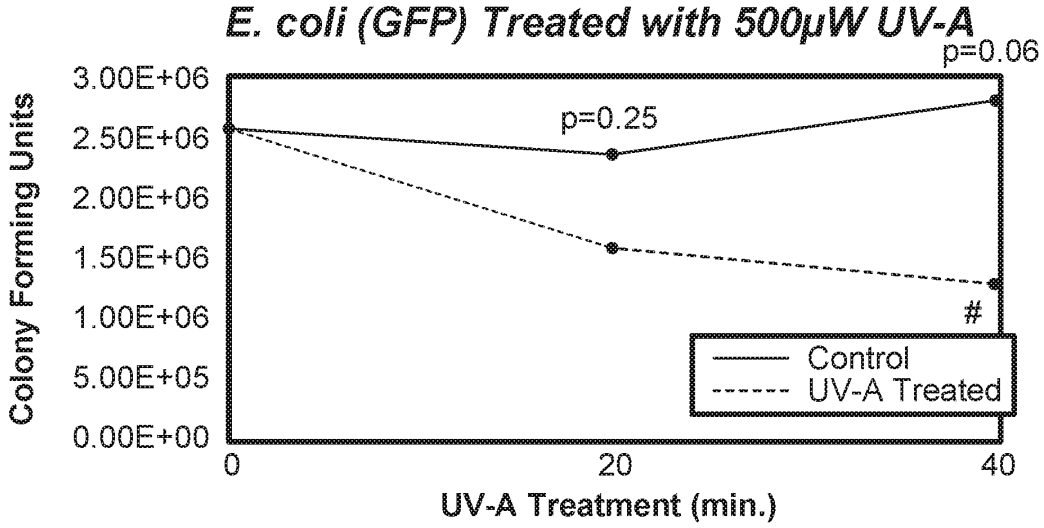


FIG. 35B

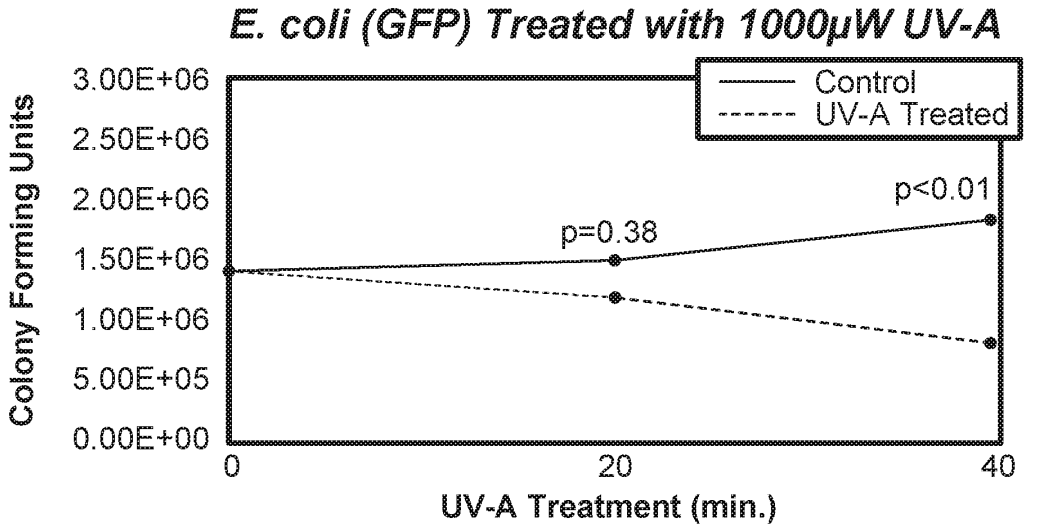


FIG. 35C

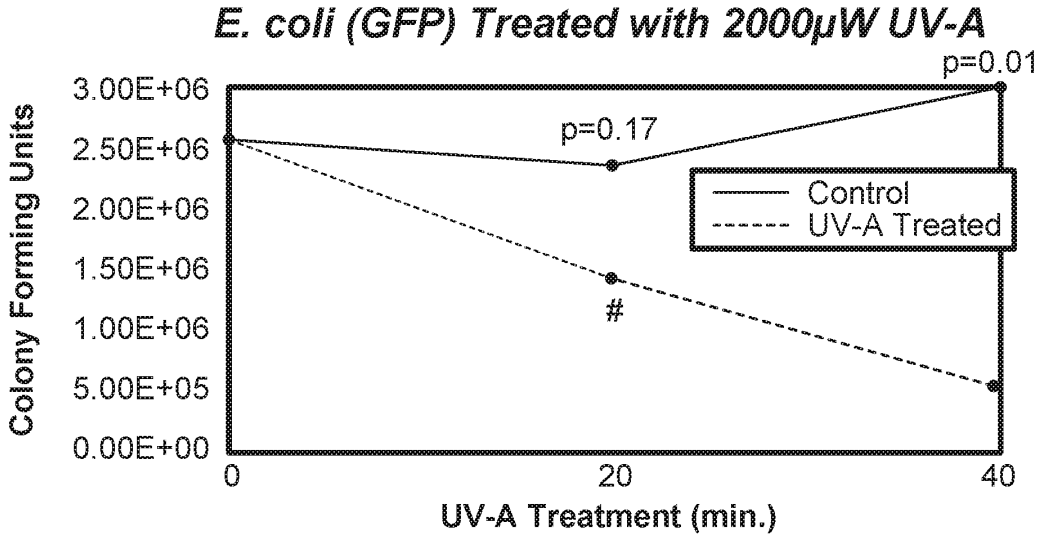


FIG. 35D

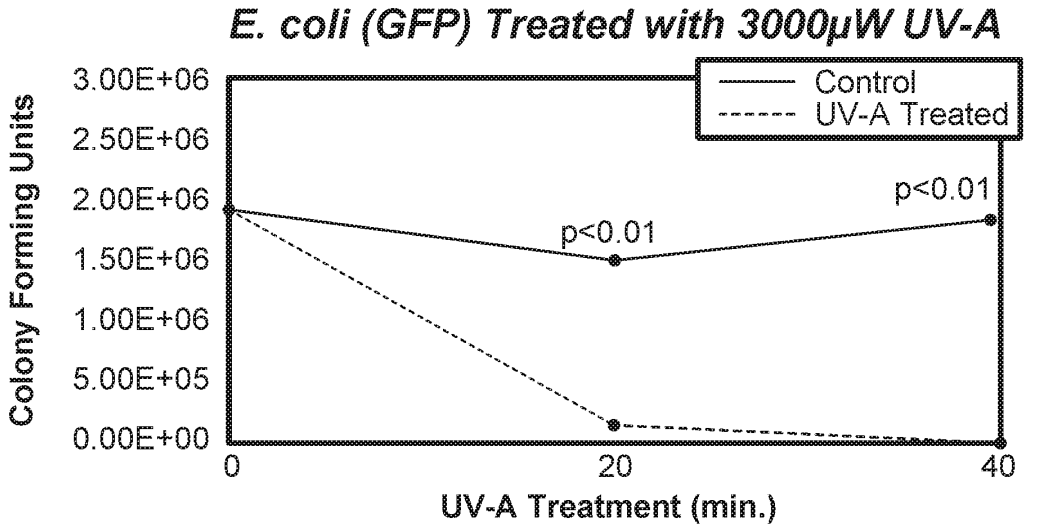


FIG. 35E

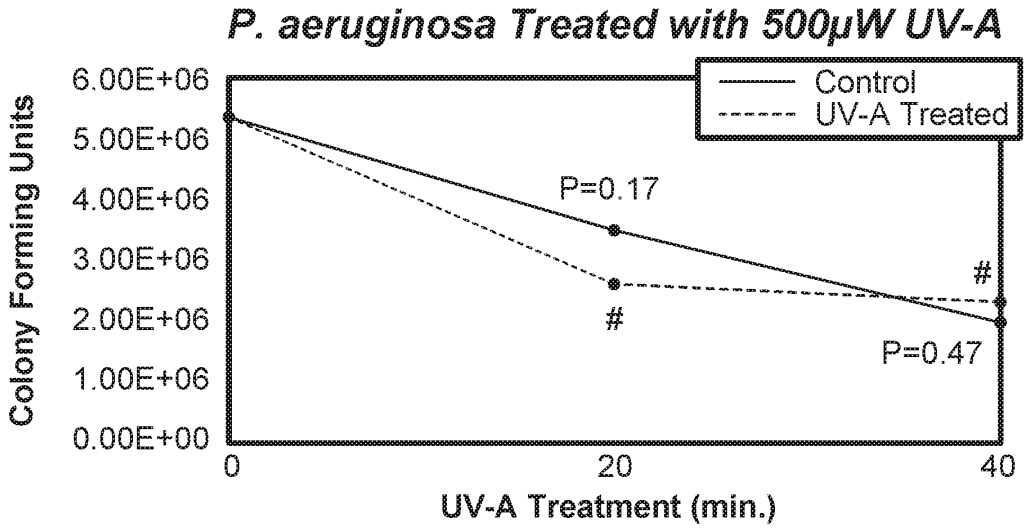

P. aeruginosa Treated with 500µW UV-A
Control
UV-A Treated
Colony Forming Units
6.00E+06
5.00E+06
4.00E+06
3.00E+06
2.00E+06
1.00E+06
0.00E+00
P=0.17
P=0.47
#
#
0
20
40
UV-A Treatment (min.)

FIG. 35G

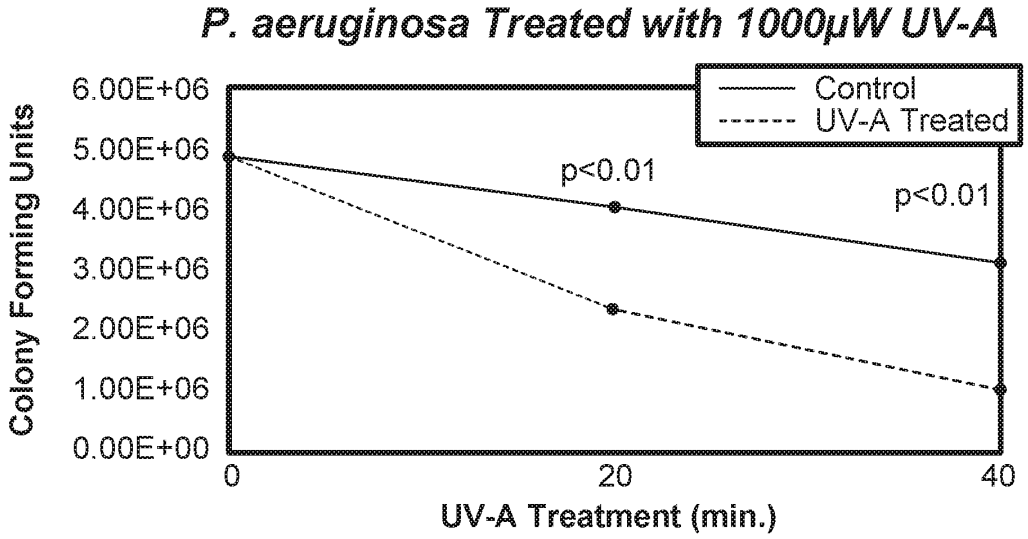


FIG. 35H

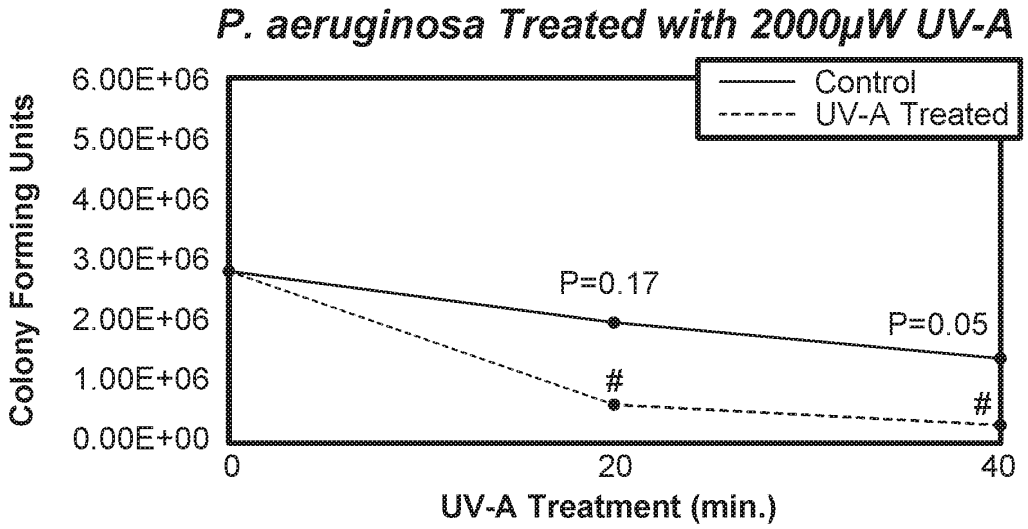


FIG. 35I

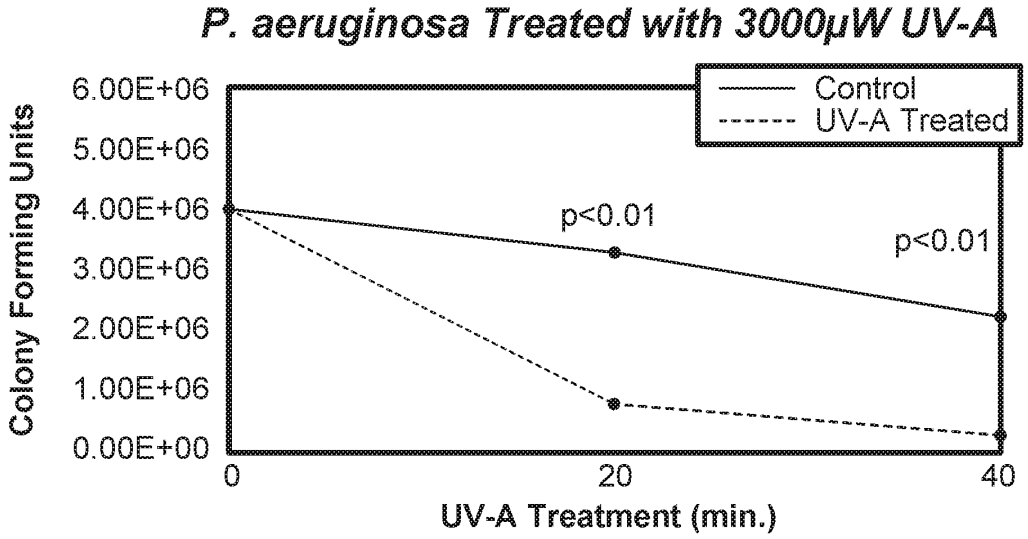


FIG. 35J

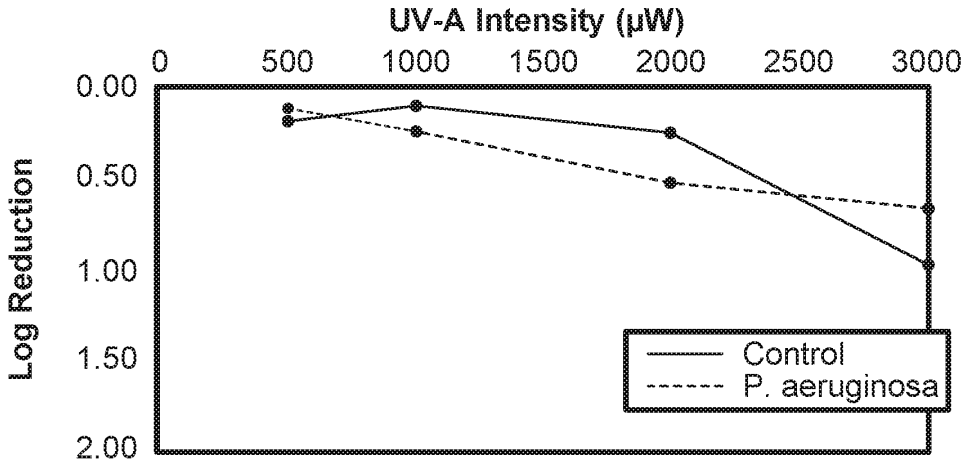


FIG. 35K

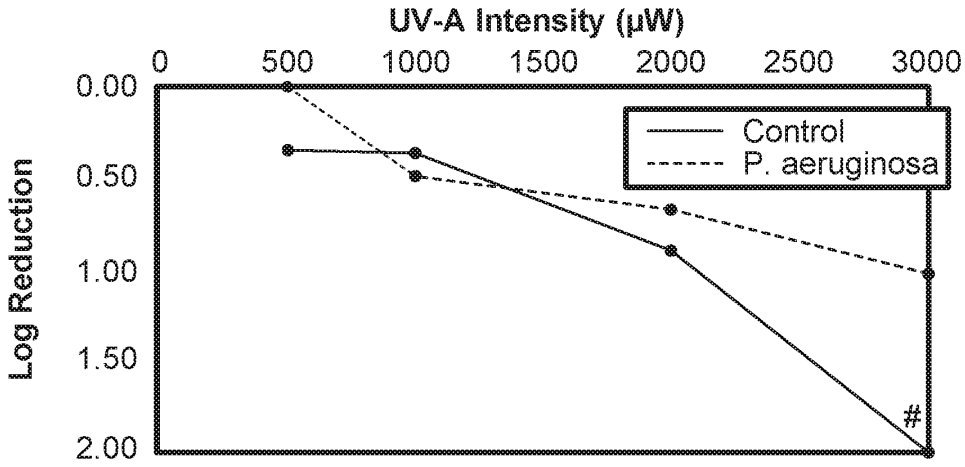


FIG. 35L

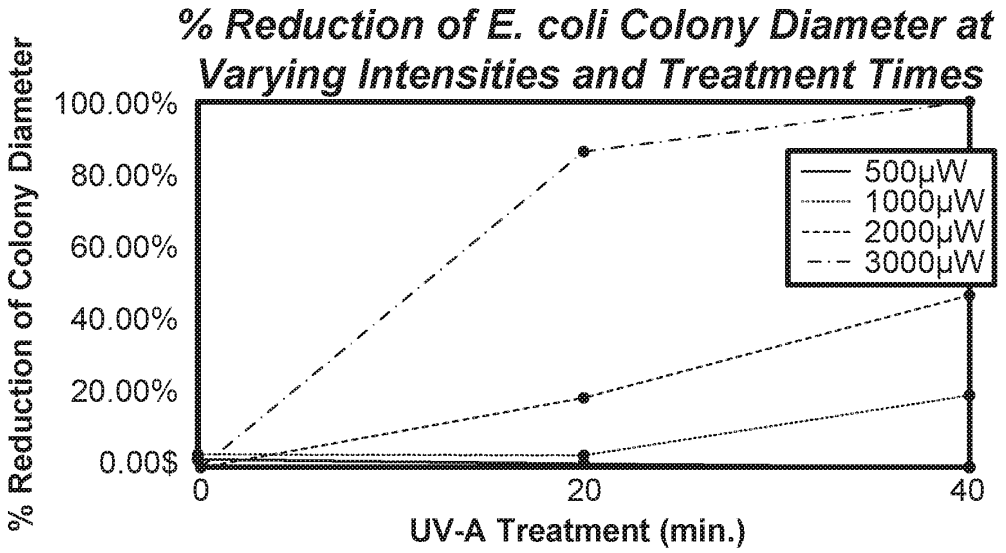


FIG. 35M

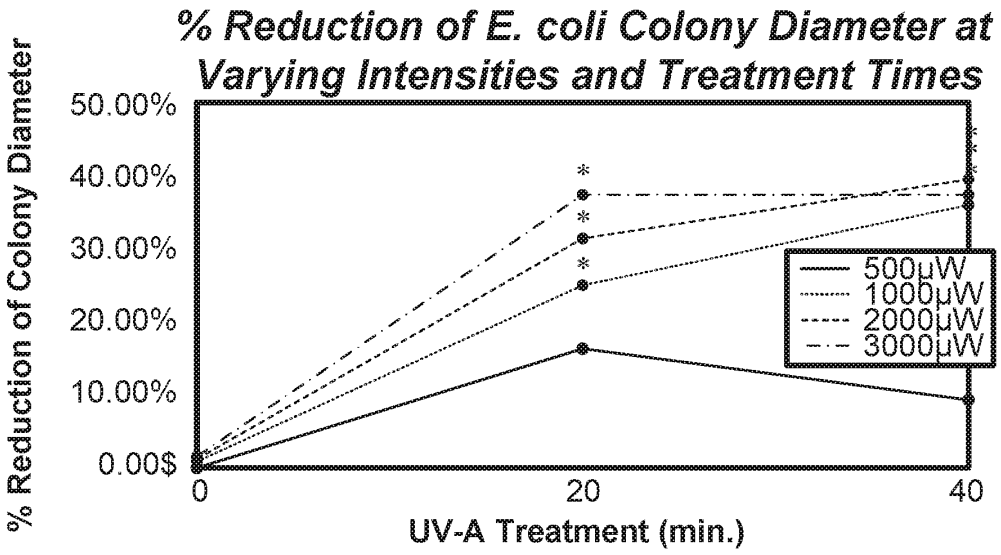

% Reduction of E. coli Colony Diameter at Varying Intensities and Treatment Times
% Reduction of Colony Diameter
50.00%
40.00%
30.00%
20.00%
10.00%
0.00$
0
20
40
UV-A Treatment (min.)
500µW
1000µW
2000µW
3000µW

FIG. 35N

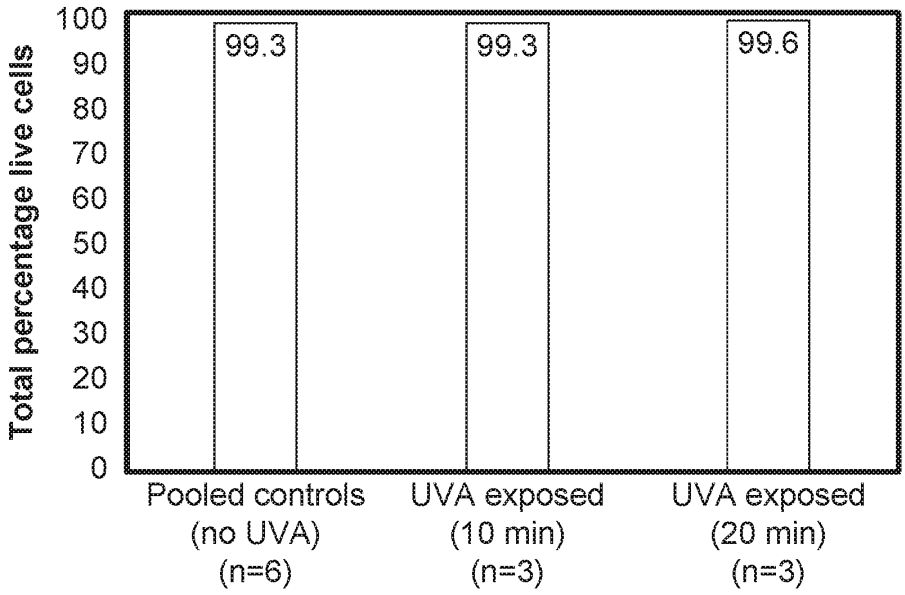


FIG. 36A

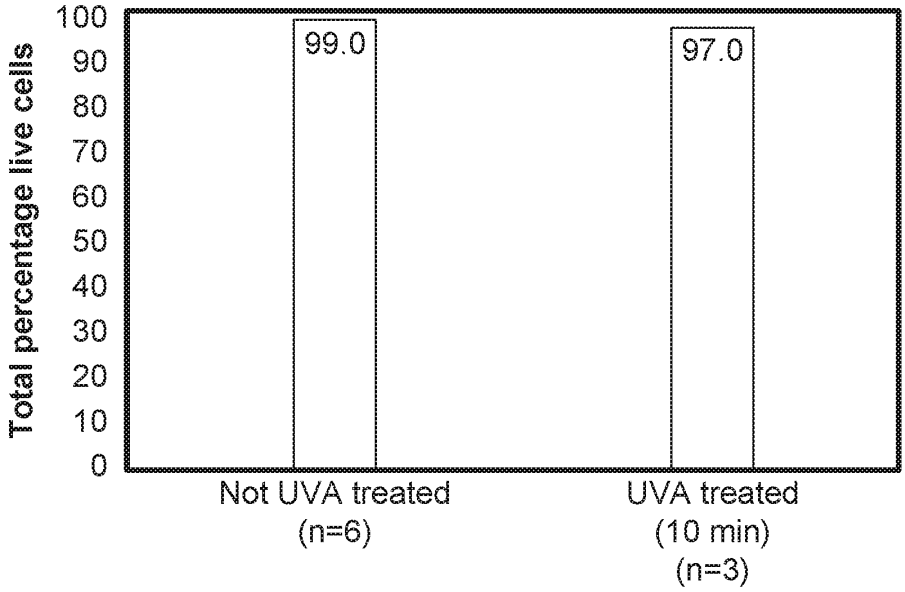


FIG. 36B

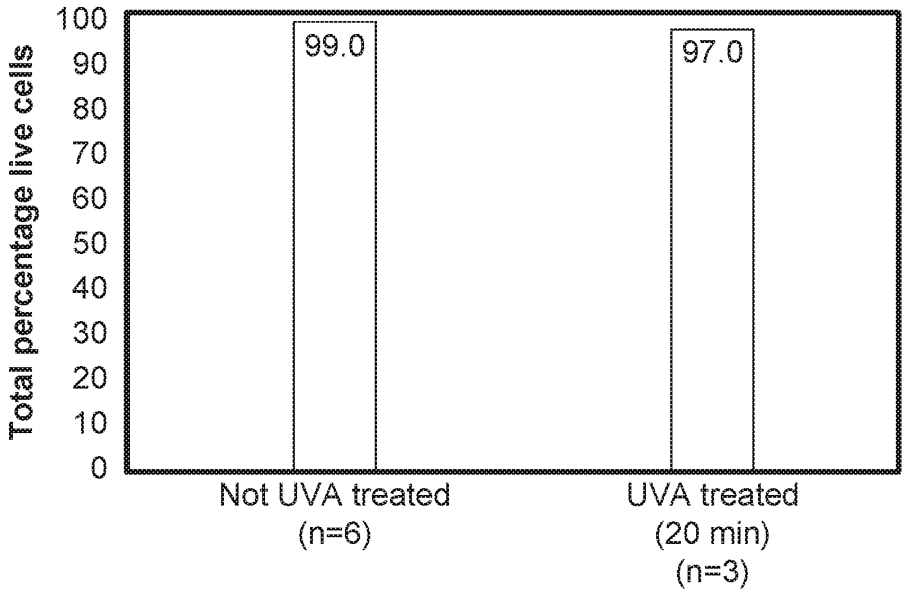


FIG. 36C

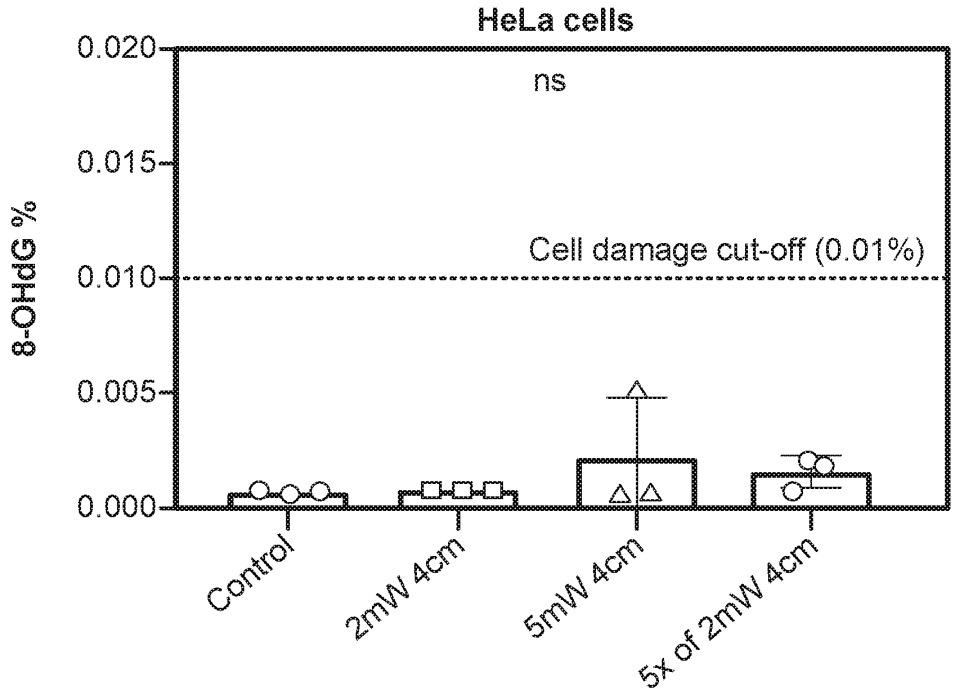


FIG. 36D

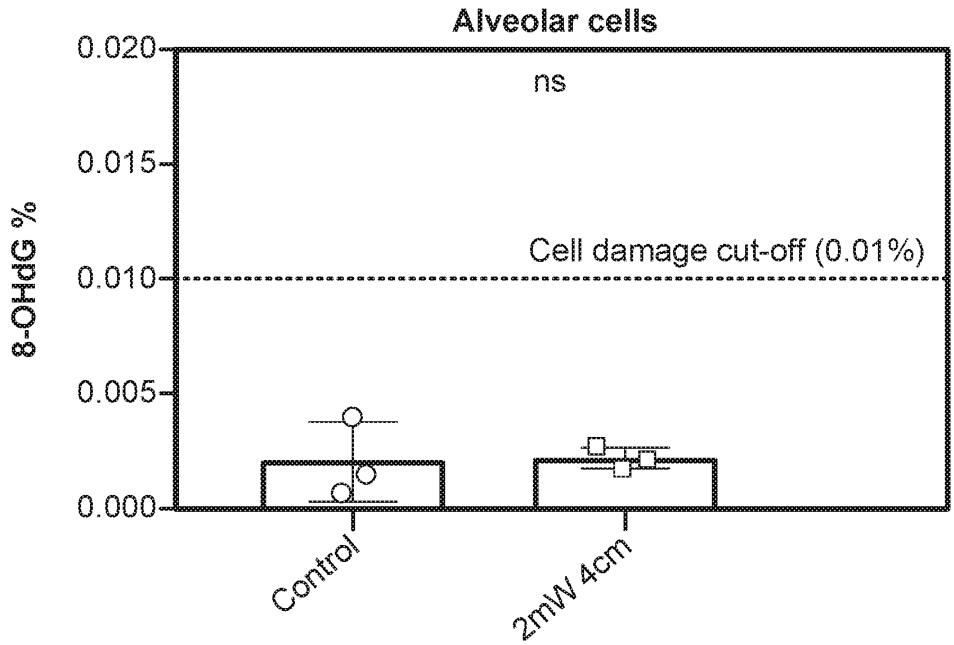


FIG. 36E

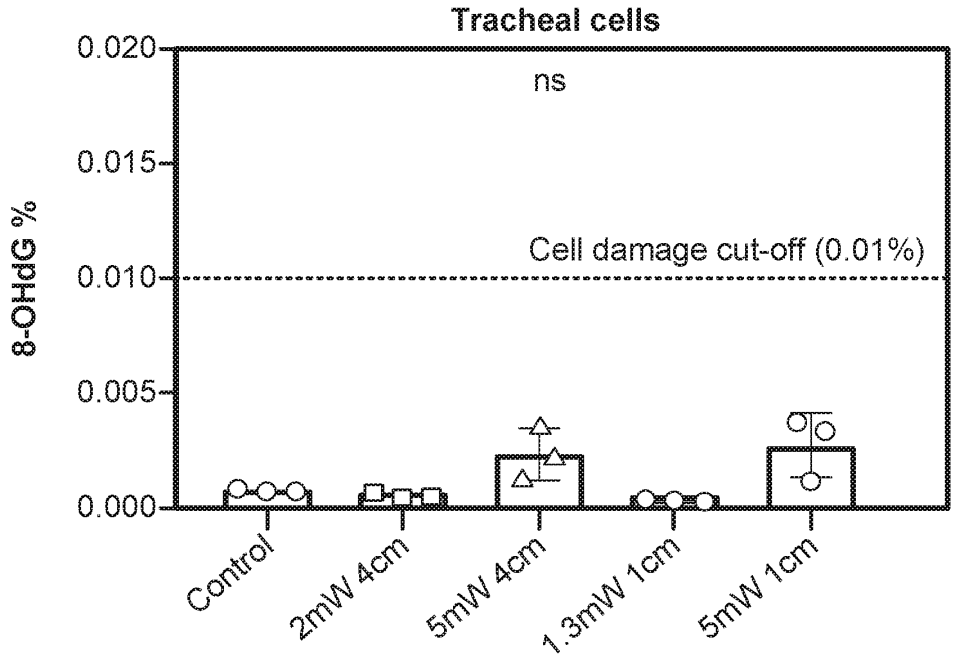


FIG. 36F

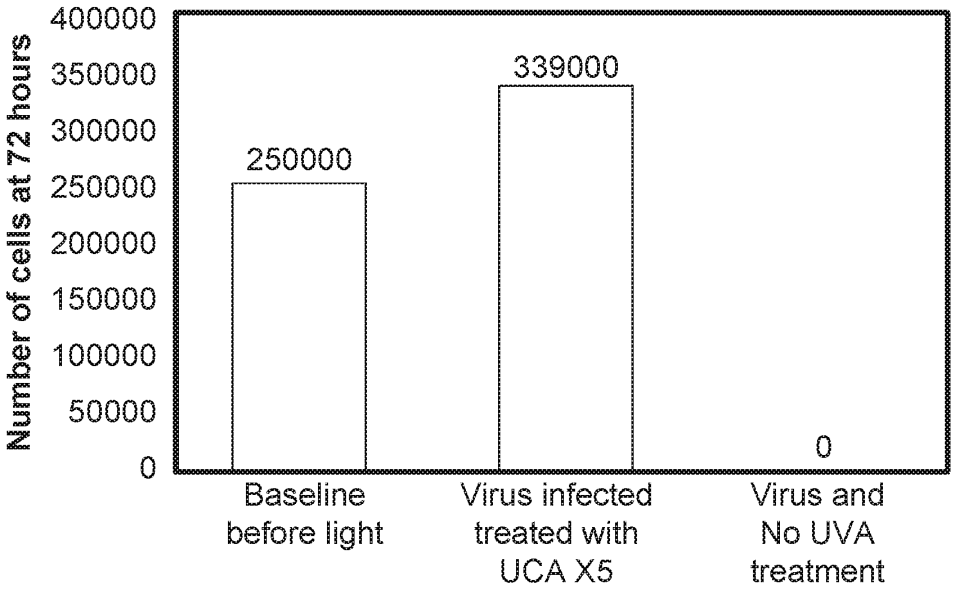

Number of cells at 72 hours
400000
350000
300000
250000
200000
150000
100000
50000
0
250000
339000
0
Baseline before light
Virus infected treated with UCA X5
Virus and No UVA treatment

FIG. 37

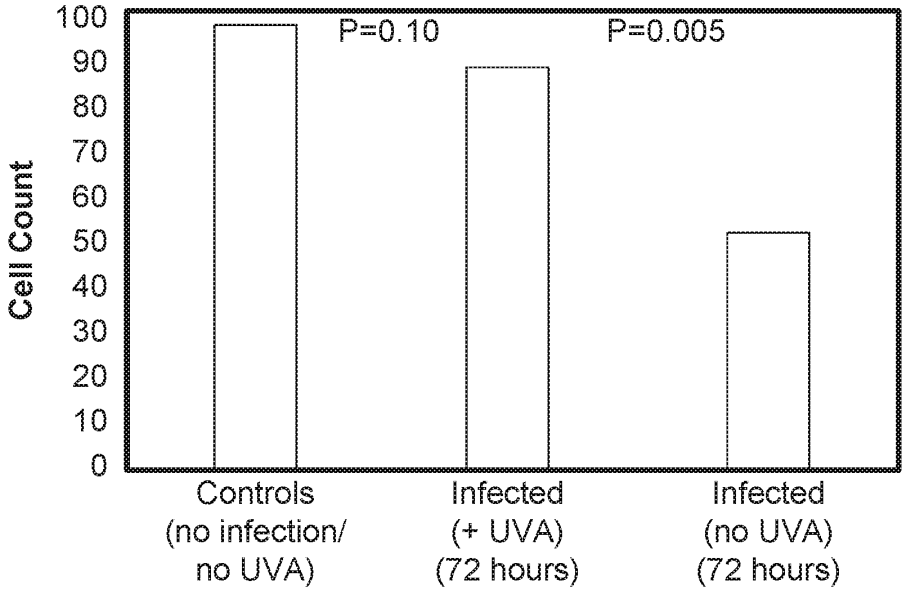

Cell Count
100
90
80
70
60
50
40
30
20
10
0
P=0.10
P=0.005
Controls (no infection/ no UVA)
Infected (+ UVA) (72 hours)
Infected (no UVA) (72 hours)

FIG. 38