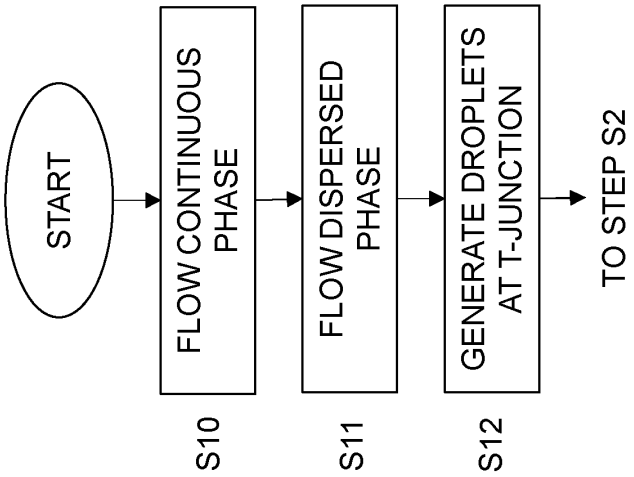

START
FLOW CONTINUOUS PHASE
FLOW DISPERSED PHASE
GENERATE DROPLETS AT T-JUNCTION
TO STEP S2
S10
S11
S12

Fig. 2

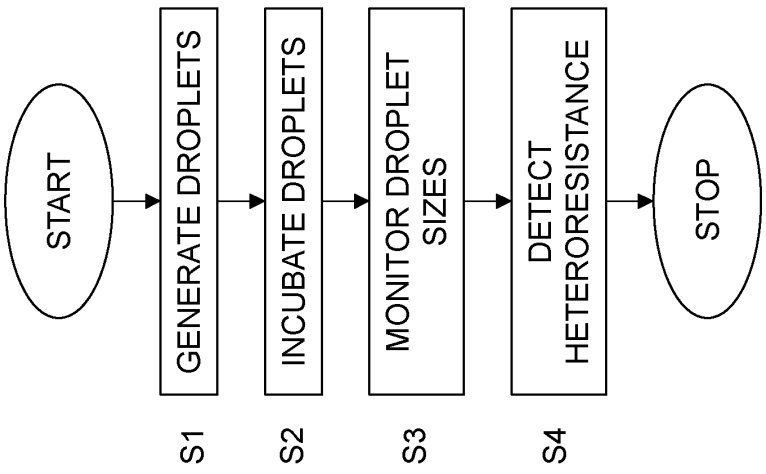

START
GENERATE DROPLETS
INCUBATE DROPLETS
MONITOR DROPLET SIZES
DETECT HETERORESISTANCE
STOP
S1
S2
S3
S4

Fig. 1

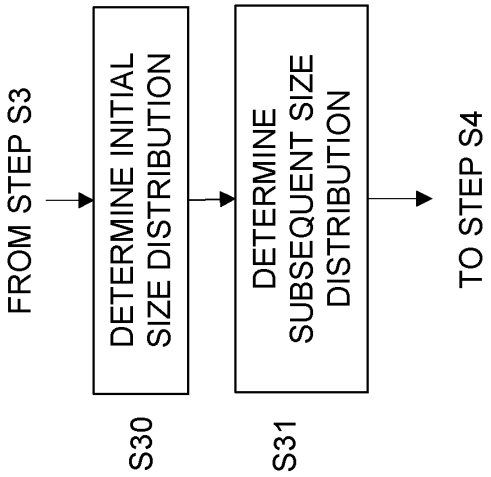

FROM STEP S3
DETERMINE INITIAL SIZE DISTRIBUTION
DETERMINE SUBSEQUENT SIZE DISTRIBUTION
TO STEP S4
S30
S31

Fig. 4

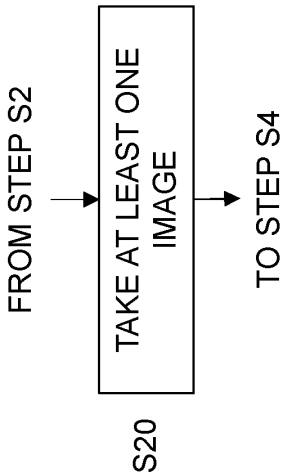

FROM STEP S2
TAKE AT LEAST ONE IMAGE
TO STEP S4
S20

Fig. 3

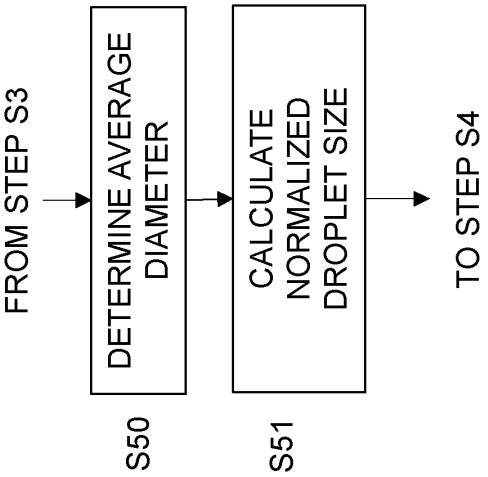

FROM STEP S3
DETERMINE AVERAGE DIAMETER
CALCULATE NORMALIZED DROPLET SIZE
TO STEP S4
S50
S51

Fig. 6

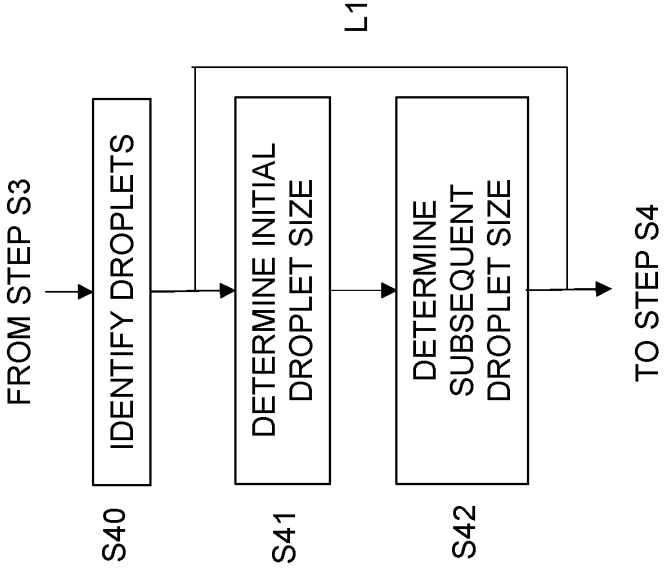

L1
FROM STEP S3
IDENTIFY DROPLETS
DETERMINE INITIAL DROPLET SIZE
DETERMINE SUBSEQUENT DROPLET SIZE
TO STEP S4
S40
S41
S42

Fig. 5

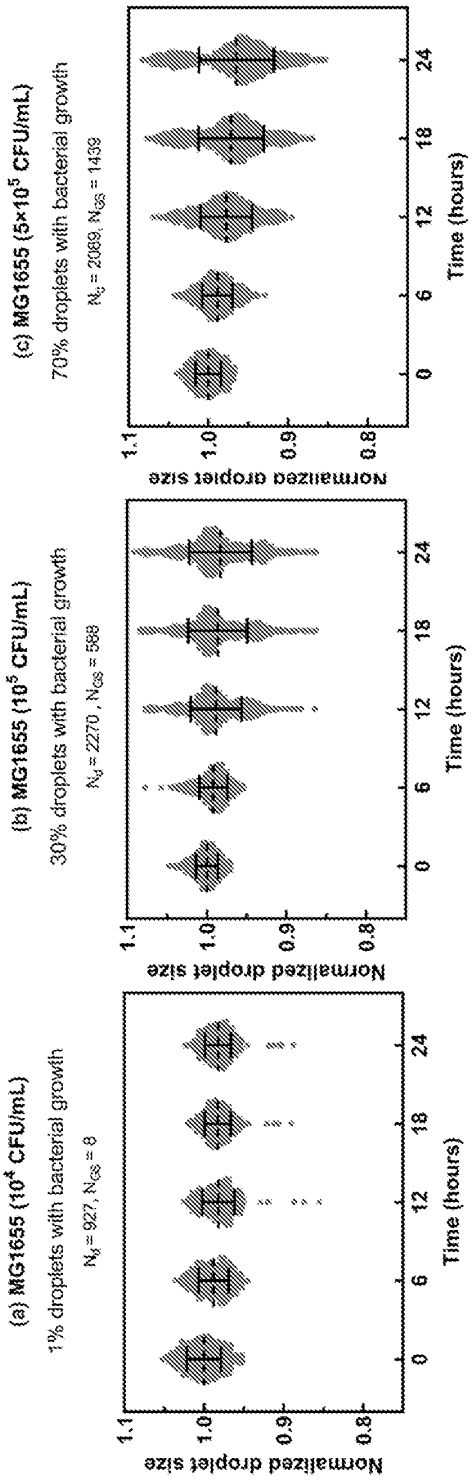

(a) MG1655 (10^4 CFU/mL)
1% droplets with bacterial growth
N_d = 927, N_{GS} = 8
(b) MG1655 (10^5 CFU/mL)
30% droplets with bacterial growth
N_d = 2270, N_{GS} = 588
(c) MG1655 (5×10^5 CFU/mL)
70% droplets with bacterial growth
N_d = 2089, N_{GS} = 1439
Normalized droplet size
Time (hours)
0
6
12
18
24
0.8
0.9
1.0
1.1

Fig. 7

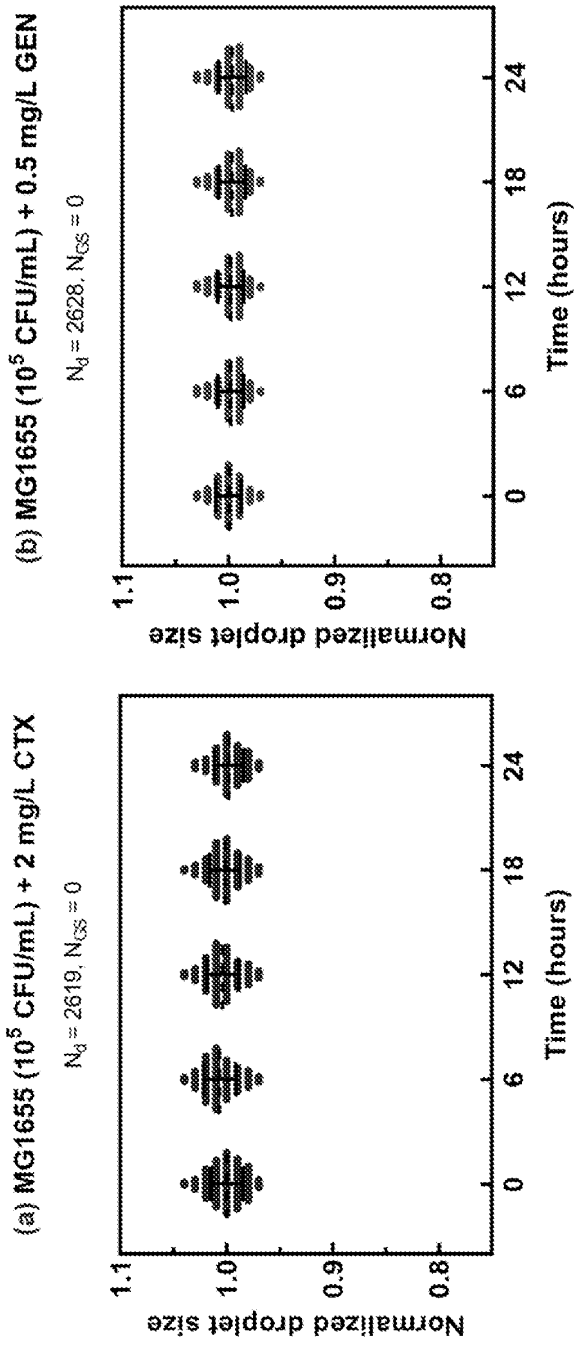

(a) MG1655 (10^5 CFU/mL) + 2 mg/L CTX
N_d = 2619, N_{CS} = 0
(b) MG1655 (10^5 CFU/mL) + 0.5 mg/L GEN
N_d = 2628, N_{CS} = 0
Normalized droplet size
1.1
1.0
0.9
0.8
0
6
12
18
24
Time (hours)

Fig. 8

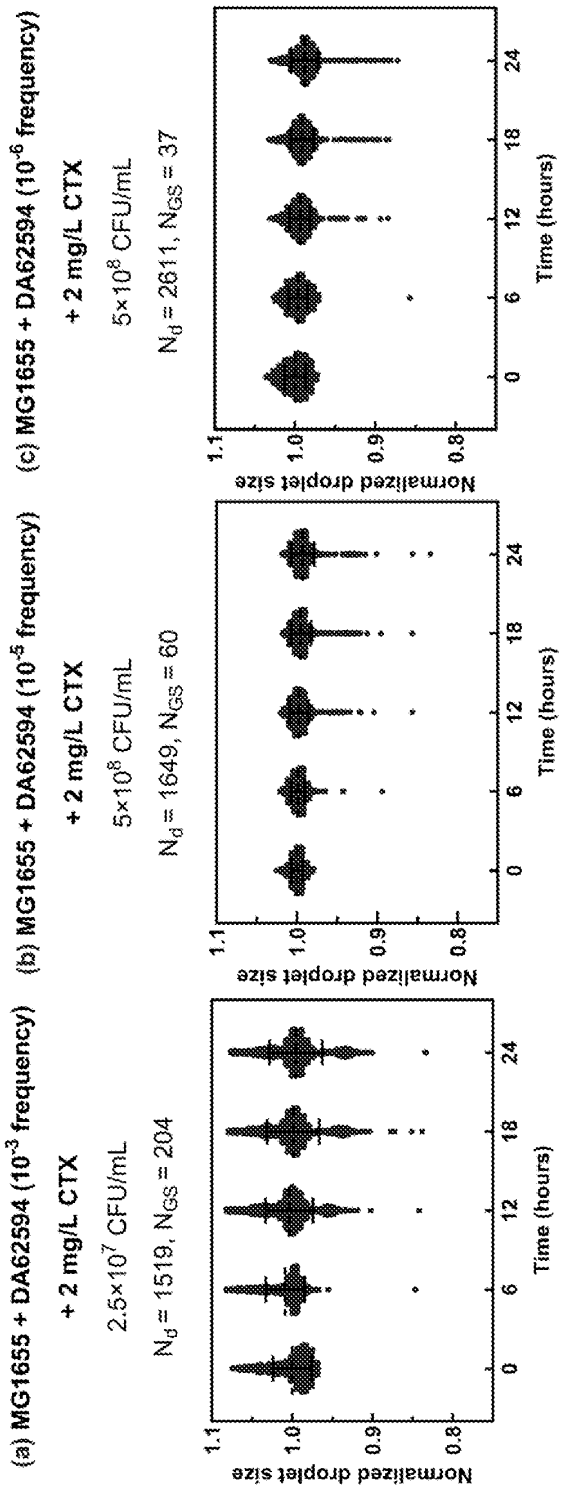

(a) MG1655 + DA62594 (10^{-3} frequency)
+ 2 mg/L CTX
2.5×10^{7} CFU/mL
N_d = 1519, N_{GS} = 204
(b) MG1655 + DA62594 (10^{-5} frequency)
+ 2 mg/L CTX
5×10^{8} CFU/mL
N_d = 1649, N_{GS} = 60
(c) MG1655 + DA62594 (10^{-6} frequency)
+ 2 mg/L CTX
5×10^{8} CFU/mL
N_d = 2611, N_{GS} = 37
Normalized droplet size
Time (hours)
1.1
1.0
0.9
0.8
0
6
12
18
24

Fig. 9

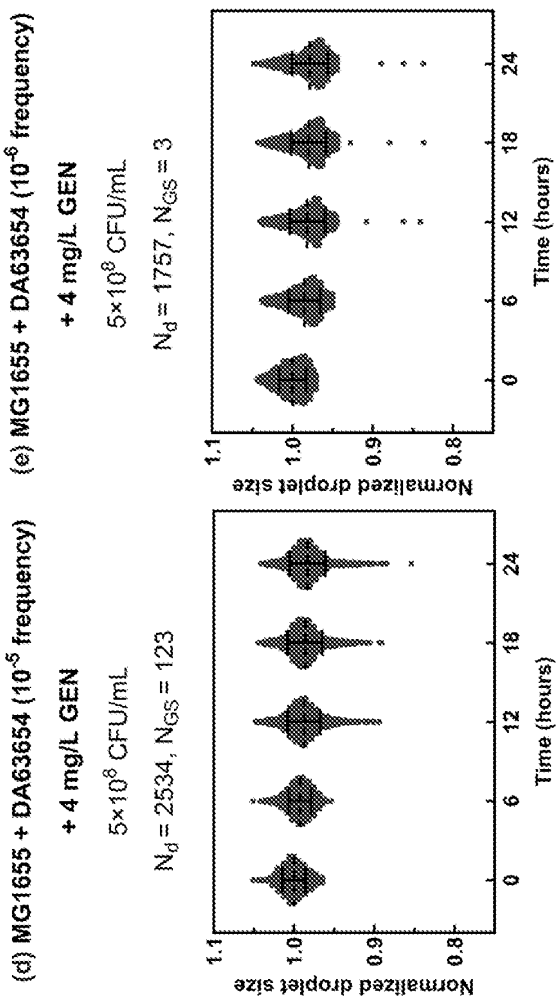

(d) MG1655 + DA63654 (10^{-5} frequency)
+ 4 mg/L GEN
5×10^{8} CFU/mL
N_d = 2534, N_{GS} = 123
(e) MG1655 + DA63654 (10^{-6} frequency)
+ 4 mg/L GEN
5×10^{8} CFU/mL
N_d = 1757, N_{GS} = 3
Normalized droplet size
1.1
1.0
0.9
0.8
0
6
12
18
24
Time (hours)

Fig. 9

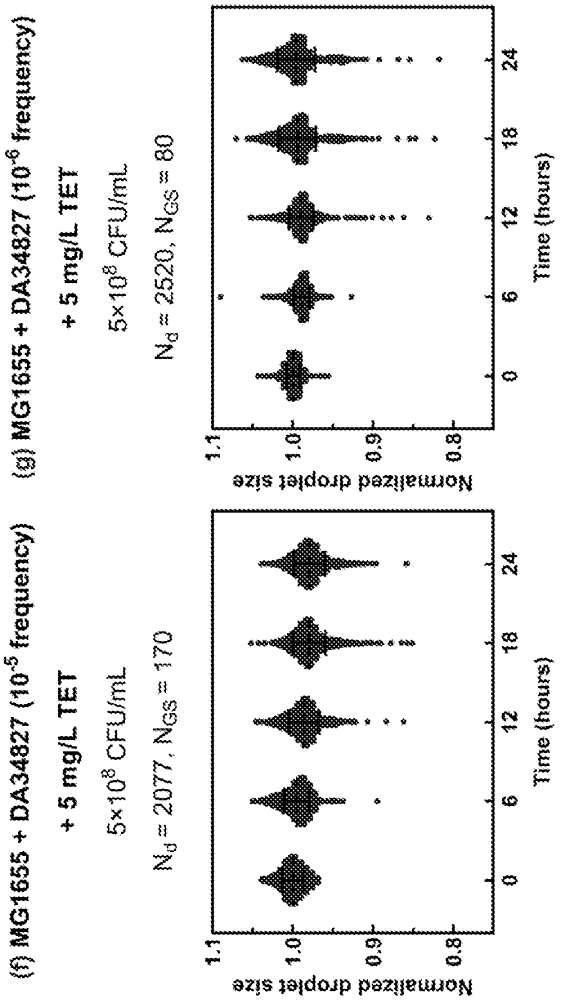

(f) MG1655 + DA34827 (10^{-5} frequency)
+ 5 mg/L TET
5×10^{8} CFU/mL
N_d = 2077, N_{GS} = 170
(g) MG1655 + DA34827 (10^{-6} frequency)
+ 5 mg/L TET
5×10^{8} CFU/mL
N_d = 2520, N_{GS} = 80
Normalized droplet size
1.1
1.0
0.9
0.8
0
6
12
18
24
Time (hours)

Fig. 9

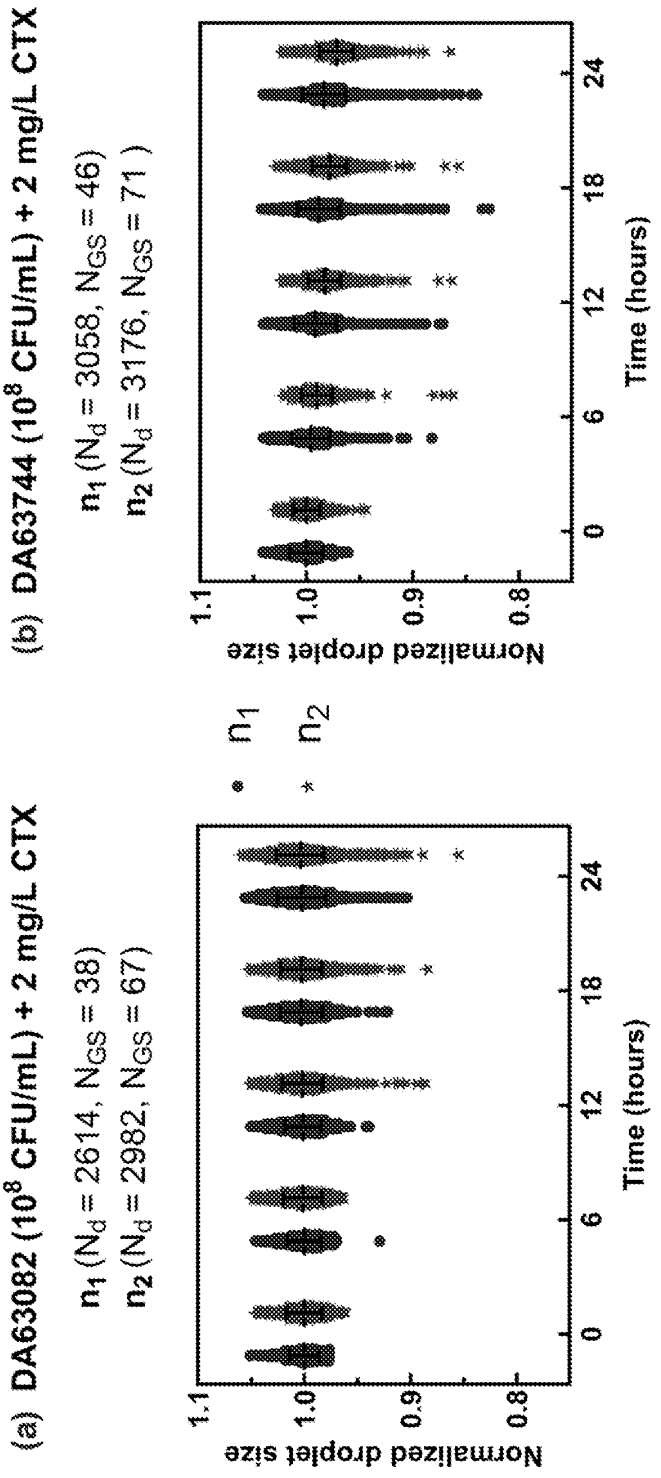

(a) DA63082 (10^8 CFU/mL) + 2 mg/L CTX
n_1 (N_d = 2614, N_{GS} = 38)
n_2 (N_d = 2982, N_{GS} = 67)
(b) DA63744 (10^8 CFU/mL) + 2 mg/L CTX
n_1 (N_d = 3058, N_{GS} = 46)
n_2 (N_d = 3176, N_{GS} = 71)
n_1
n_2
Normalized droplet size
Time (hours)
1.1
1.0
0.9
0.8
0
6
12
18
24

Fig. 10

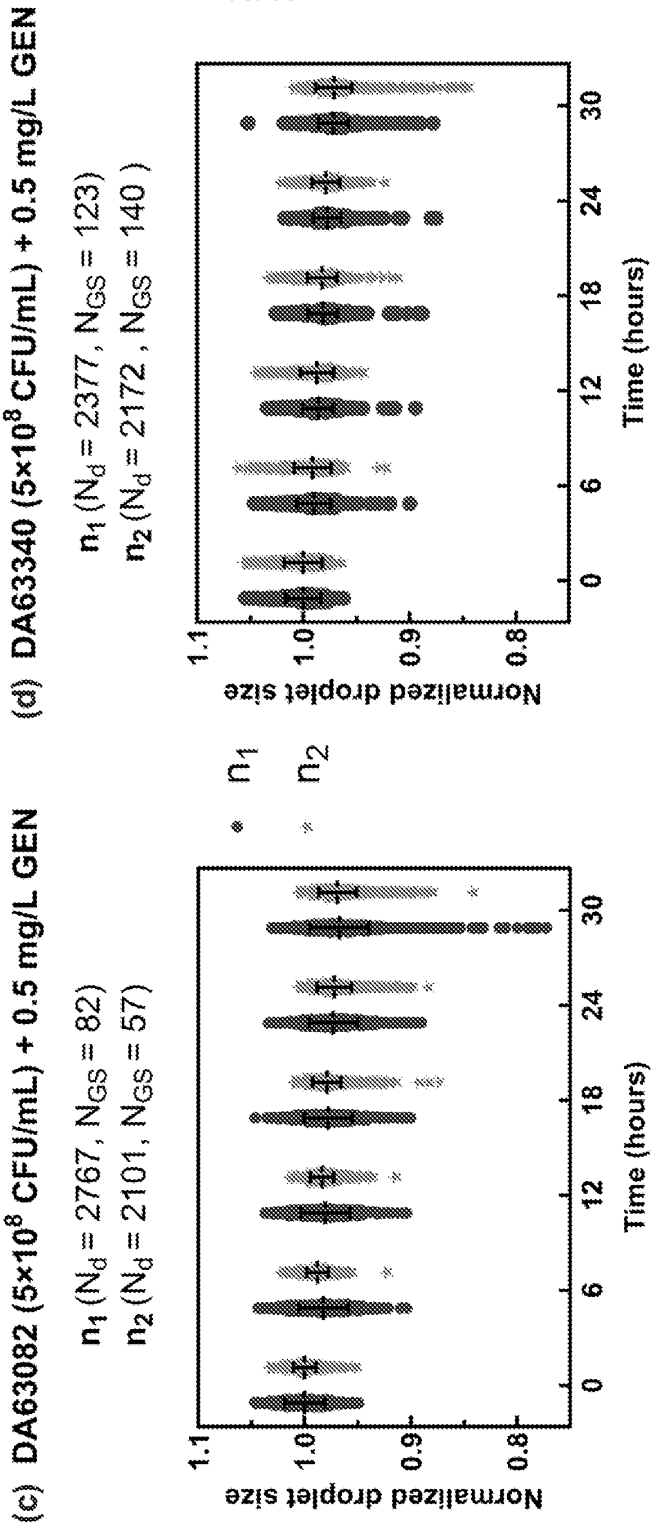

(c) DA63082 (5×10^8 CFU/mL) + 0.5 mg/L GEN
n1 (Nd = 2767, NGS = 82)
n2 (Nd = 2101, NGS = 57)
(d) DA63340 (5×10^8 CFU/mL) + 0.5 mg/L GEN
n1 (Nd = 2377, NGS = 123)
n2 (Nd = 2172 , NGS = 140)
n1
n2
Normalized droplet size
Time (hours)
1.1
1.0
0.9
0.8
0
6
12
18
24
30

Fig. 10

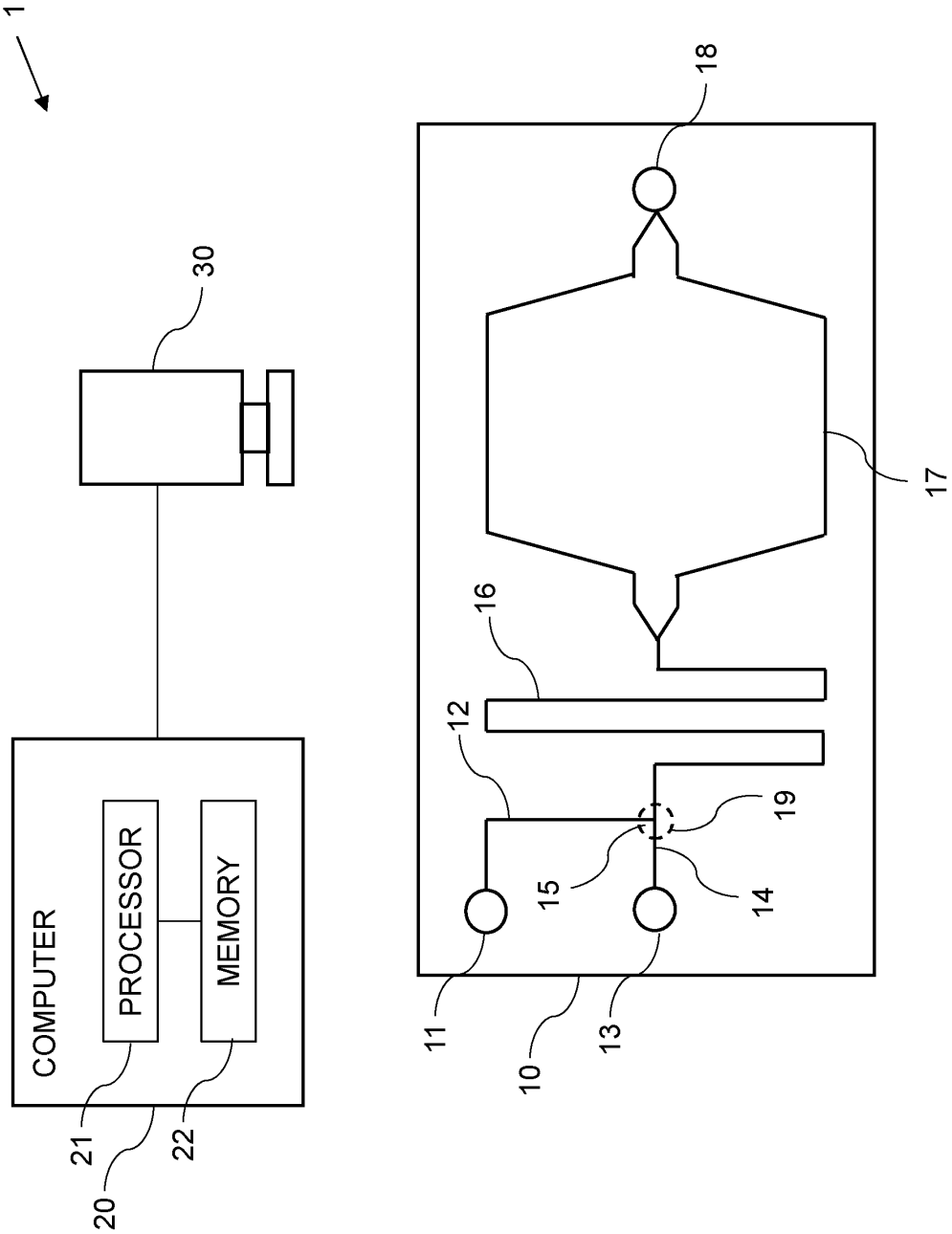

1
30
COMPUTER
PROCESSOR
MEMORY
21
20
22
18
17
16
12
19
15
14
11
10
13

Fig. 11

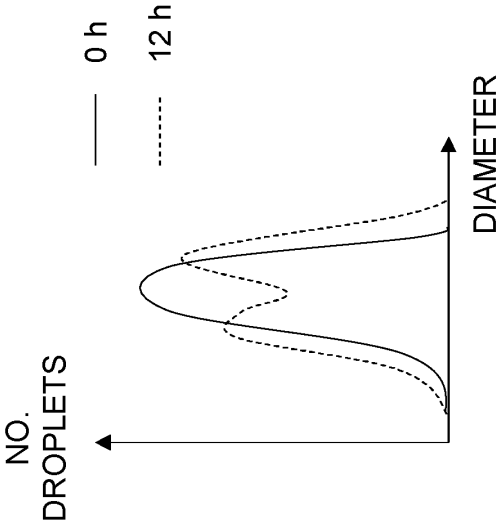


Fig. 12

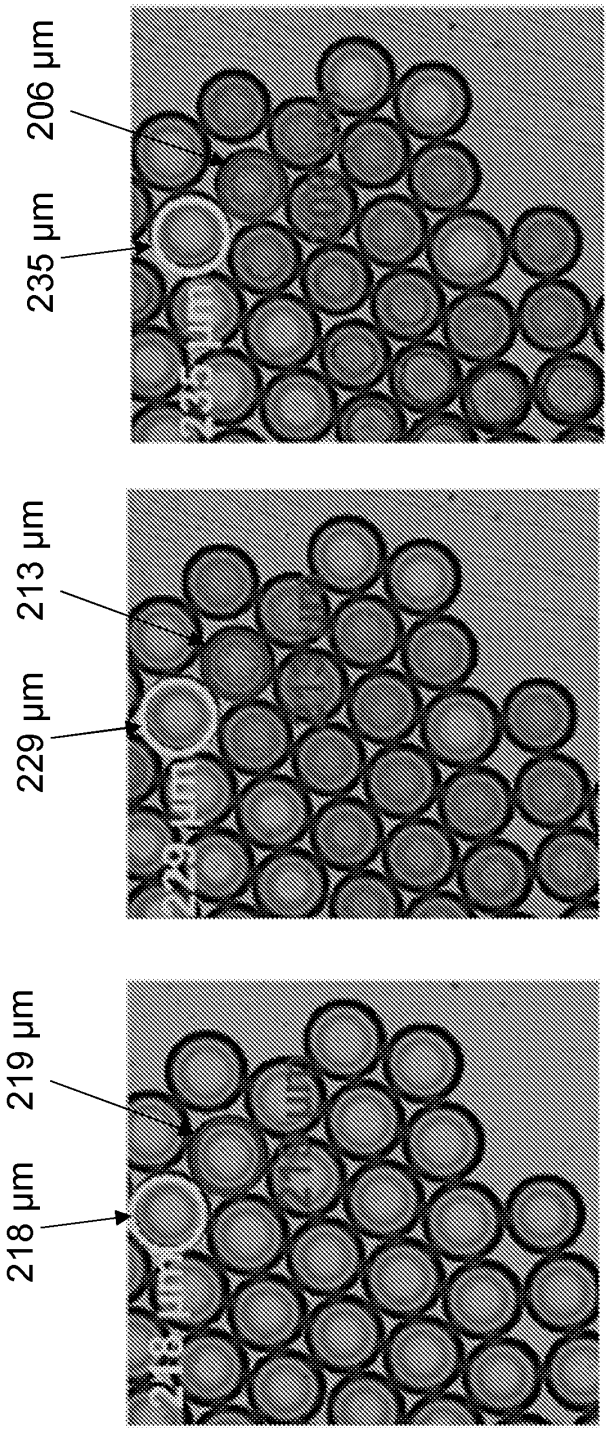

206 µm
235 µm
24 hours
213 µm
229 µm
12 hours
219 µm
218 µm
0 hours

Fig. 13

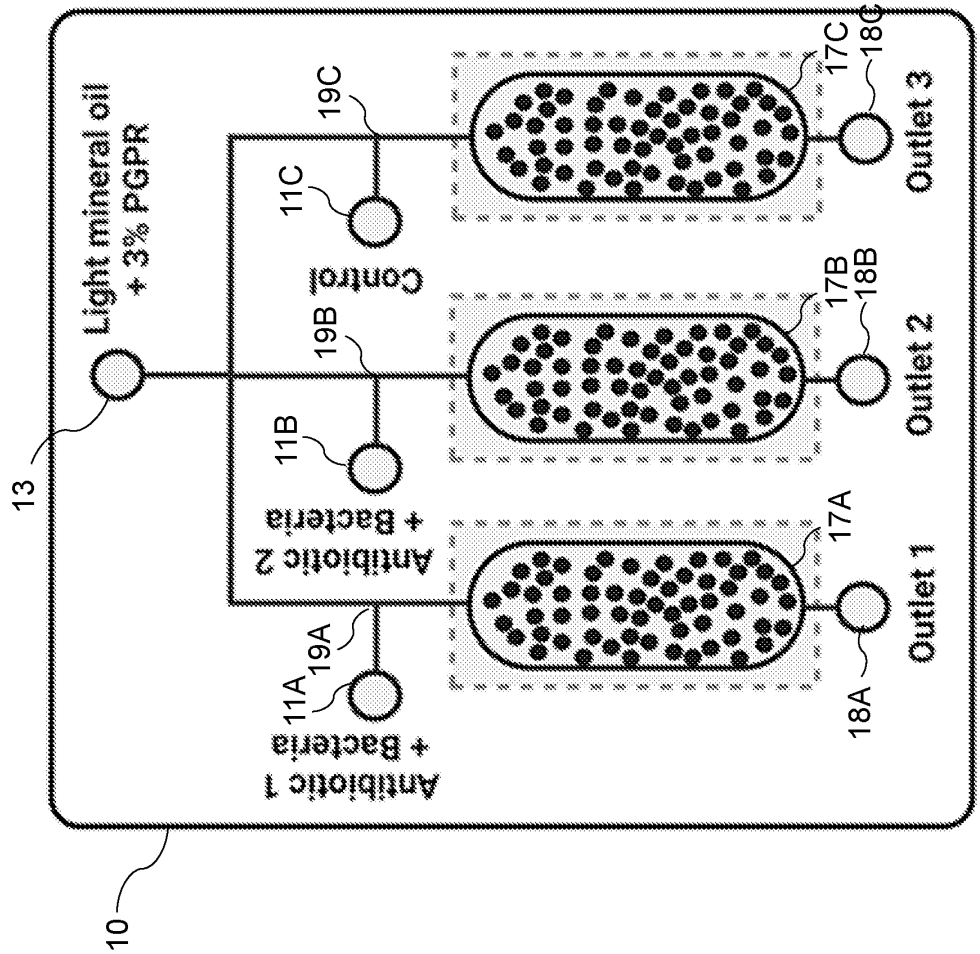

10
13
Light mineral oil
+ 3% PGPR
Antibiotic 1
+ Bacteria
11A
19A
Antibiotic 2
+ Bacteria
11B
19B
Control
11C
19C
Outlet 1
17A
18A
Outlet 2
17B
18B
Outlet 3
17C
18C

Fig. 14

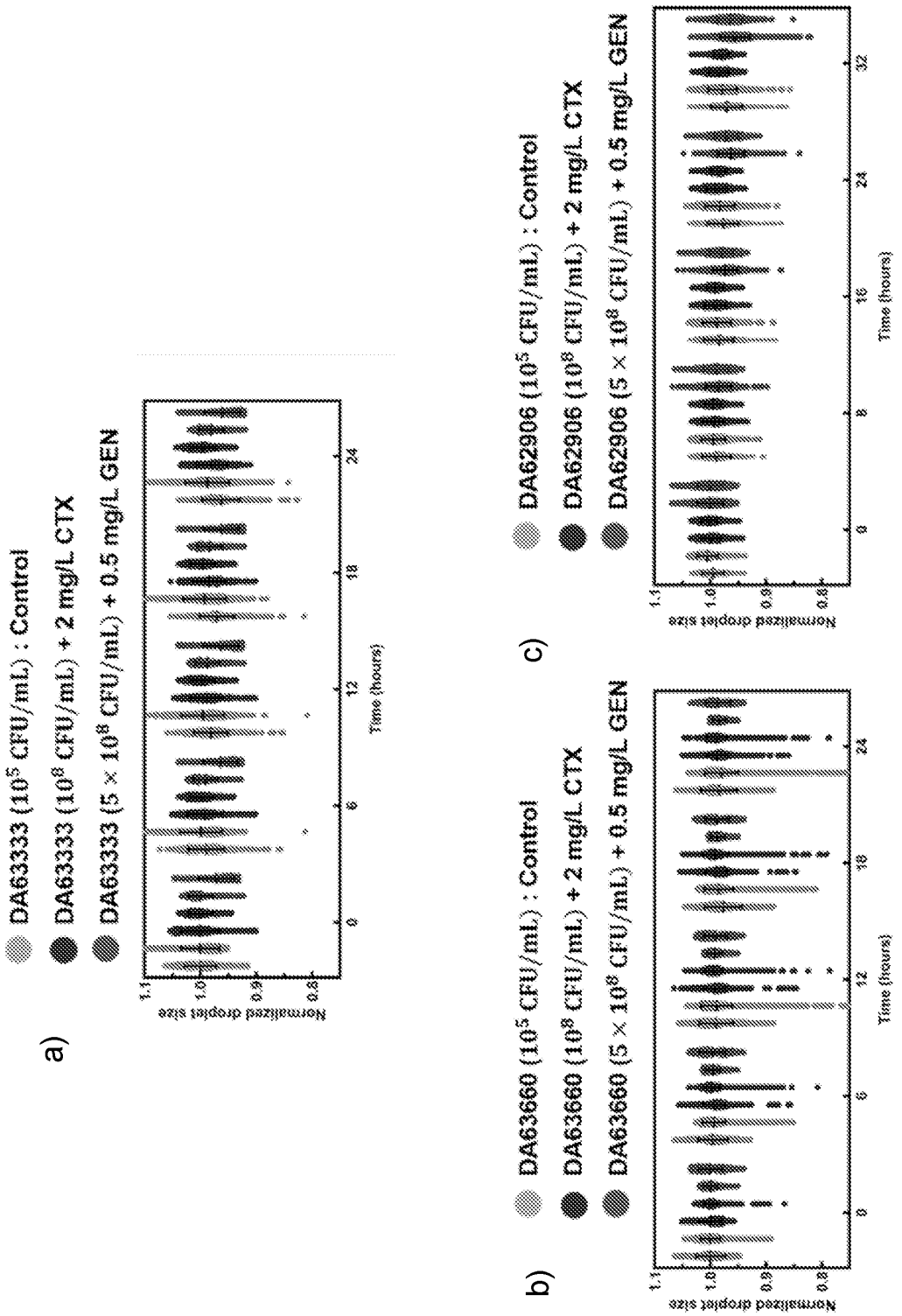

a)
DA63333 (10^5 CFU/mL) : Control
DA63333 (10^8 CFU/mL) + 2 mg/L CTX
DA63333 (5×10^8 CFU/mL) + 0.5 mg/L GEN
Normalized droplet size
Time (hours)
b)
DA63660 (10^5 CFU/mL) : Control
DA63660 (10^8 CFU/mL) + 2 mg/L CTX
DA63660 (5×10^8 CFU/mL) + 0.5 mg/L GEN
Normalized droplet size
Time (hours)
c)
DA62906 (10^5 CFU/mL) : Control
DA62906 (10^8 CFU/mL) + 2 mg/L CTX
DA62906 (5×10^8 CFU/mL) + 0.5 mg/L GEN
Normalized droplet size
Time (hours)

Fig. 15

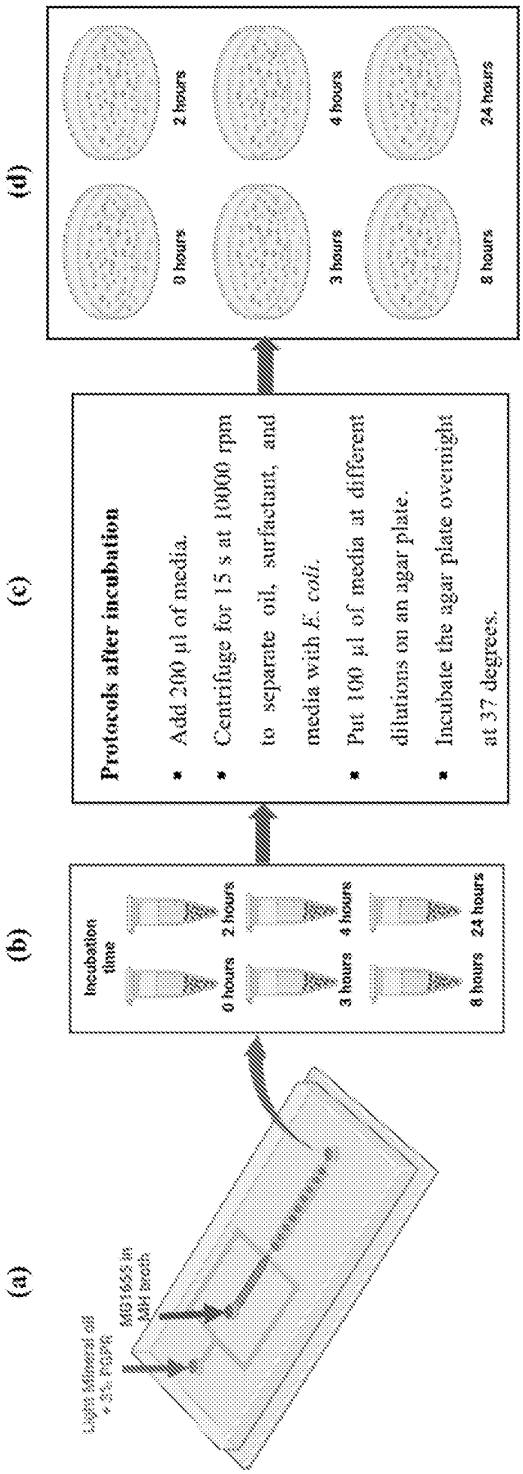

(a)
(b)
(c)
(d)
Incubation time
0 hours
2 hours
3 hours
4 hours
8 hours
24 hours
Protocols after incubation
Add 200 µl of media.
Centrifuge for 15 s at 10000 rpm to separate oil, surfactant, and media with E. coli.
Put 100 µl of media at different dilutions on an agar plate.
Incubate the agar plate overnight at 37 degrees.

Fig. 16

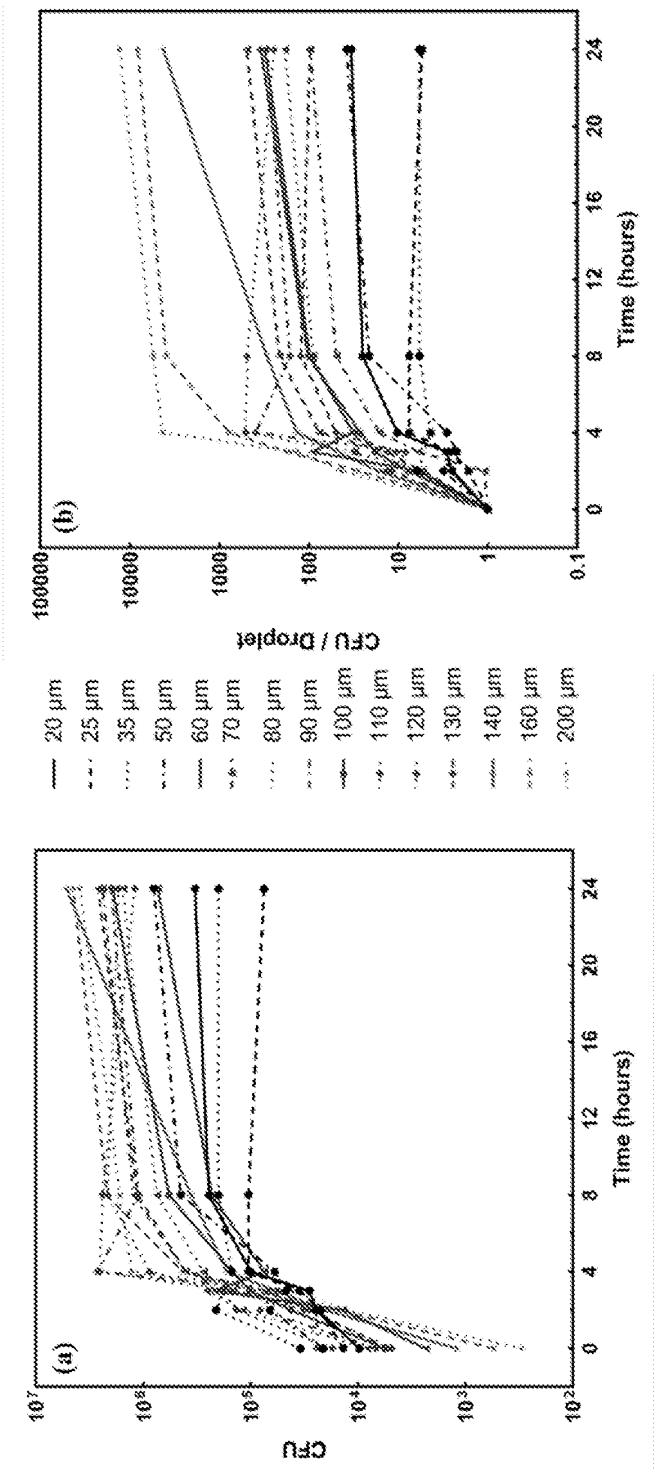

(b)
CFU / Droplet
Time (hours)
20 µm
25 µm
35 µm
50 µm
60 µm
70 µm
80 µm
90 µm
100 µm
110 µm
120 µm
130 µm
140 µm
160 µm
200 µm
(a)
CFU
Time (hours)

Fig. 17

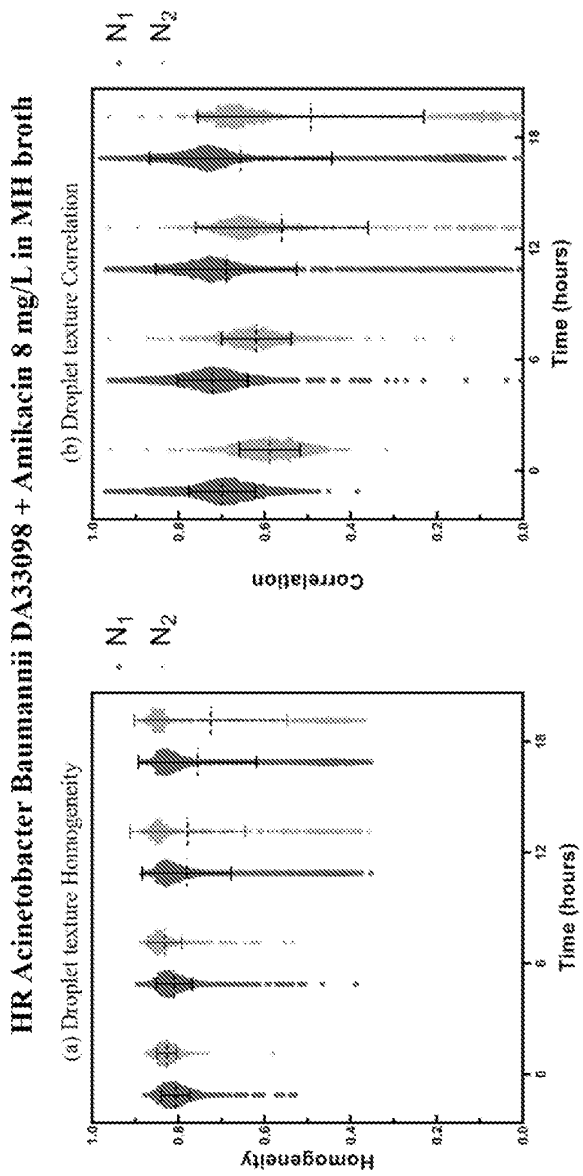

HR Acinetobacter Baumannii DA33098 + Amikacin 8 mg/L in MH broth
(a) Droplet texture Homogeneity
(b) Droplet texture Correlation
N1
N2
Homogeneity
Correlation
Time (hours)
0
6
12
18
0.0
0.2
0.4
0.6
1.0

Fig. 18