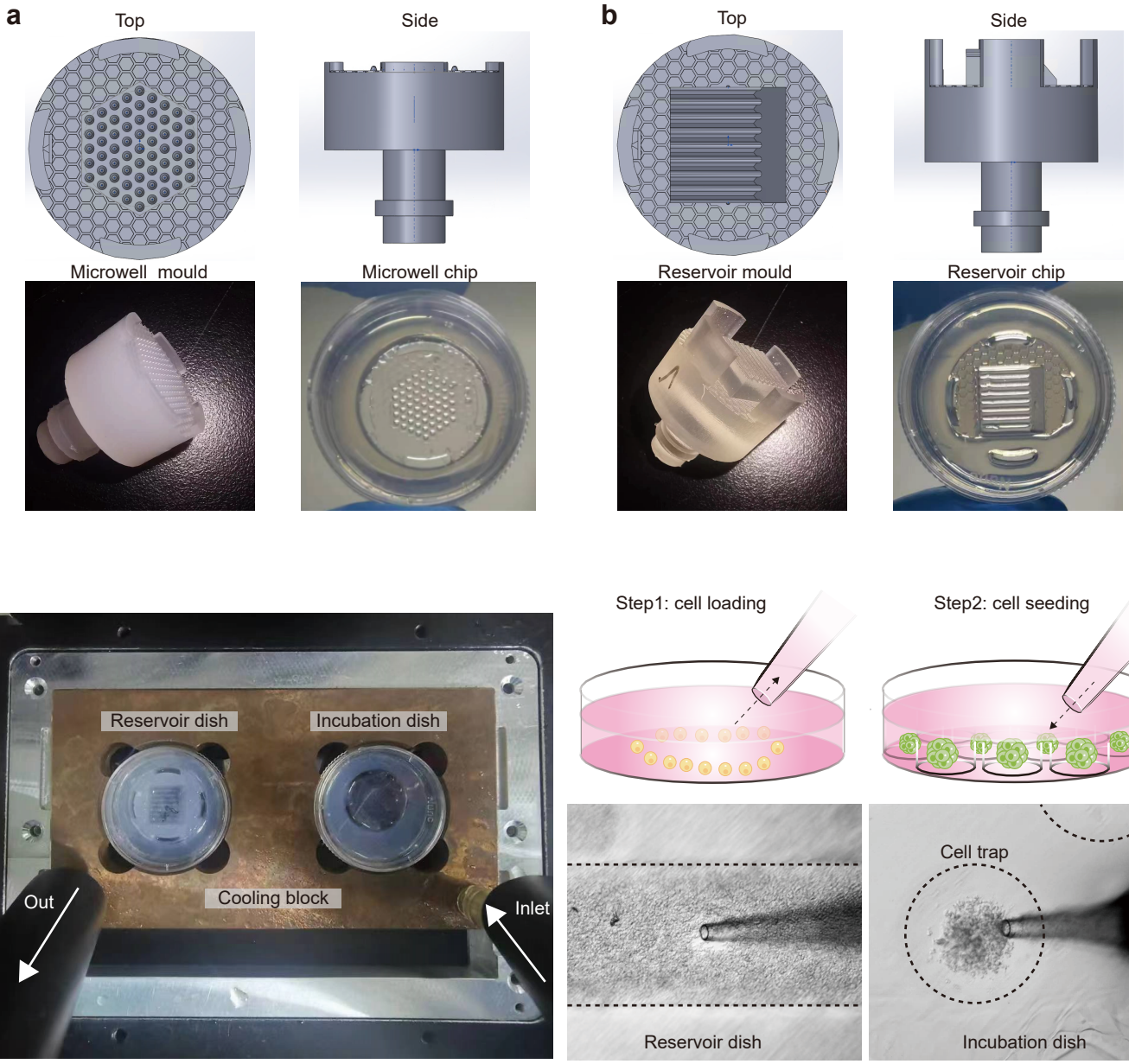
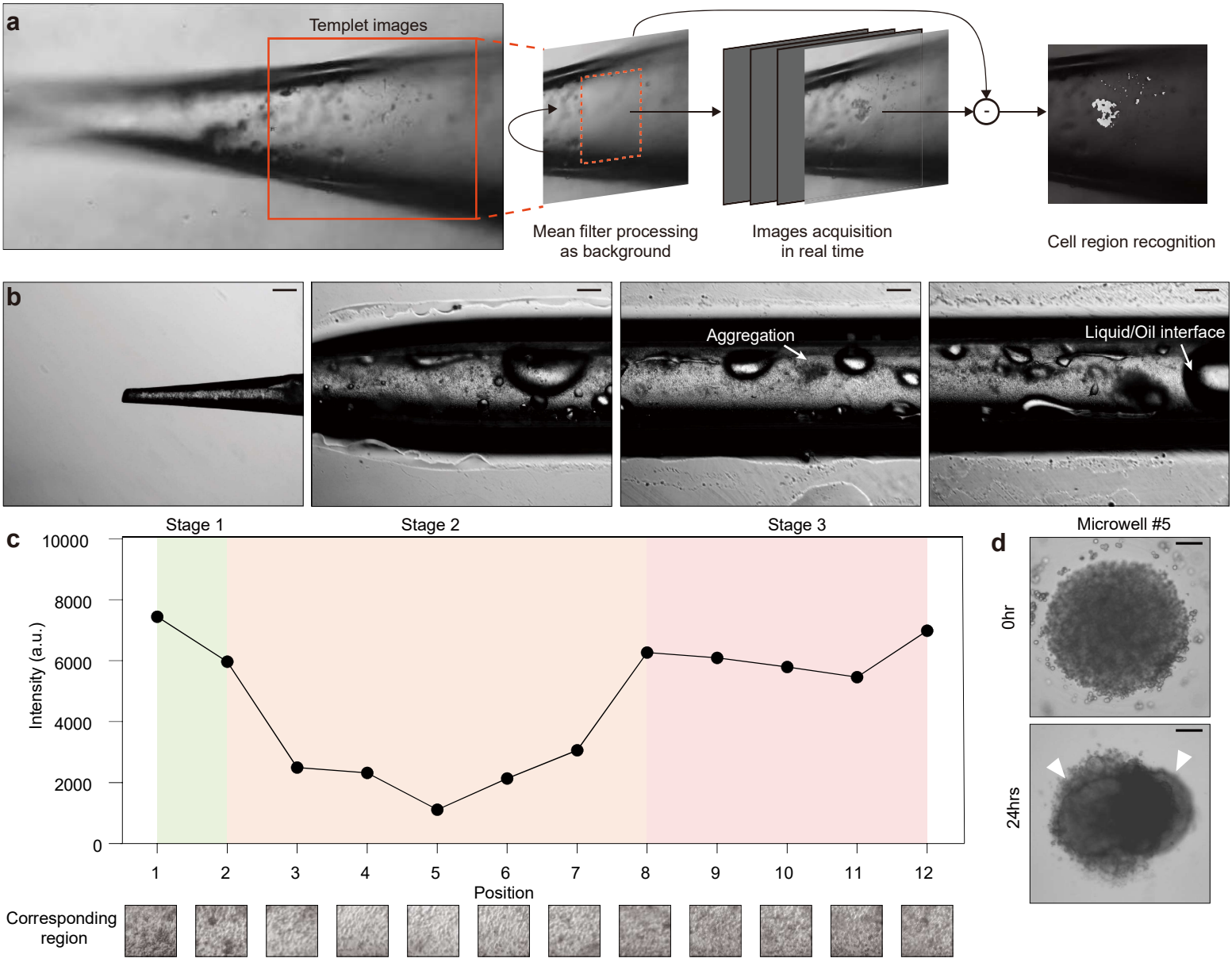


Supplementary Figure 1



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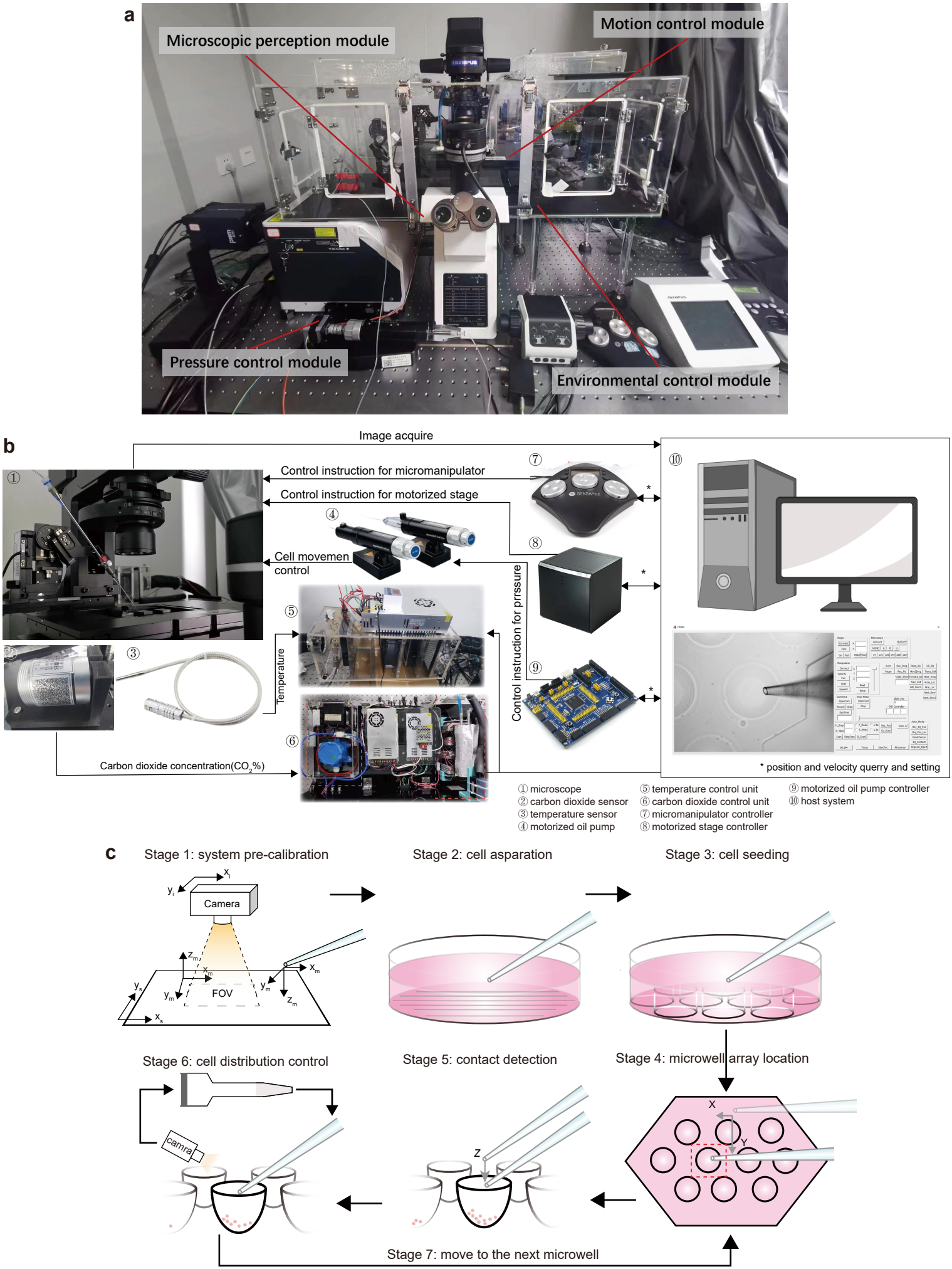

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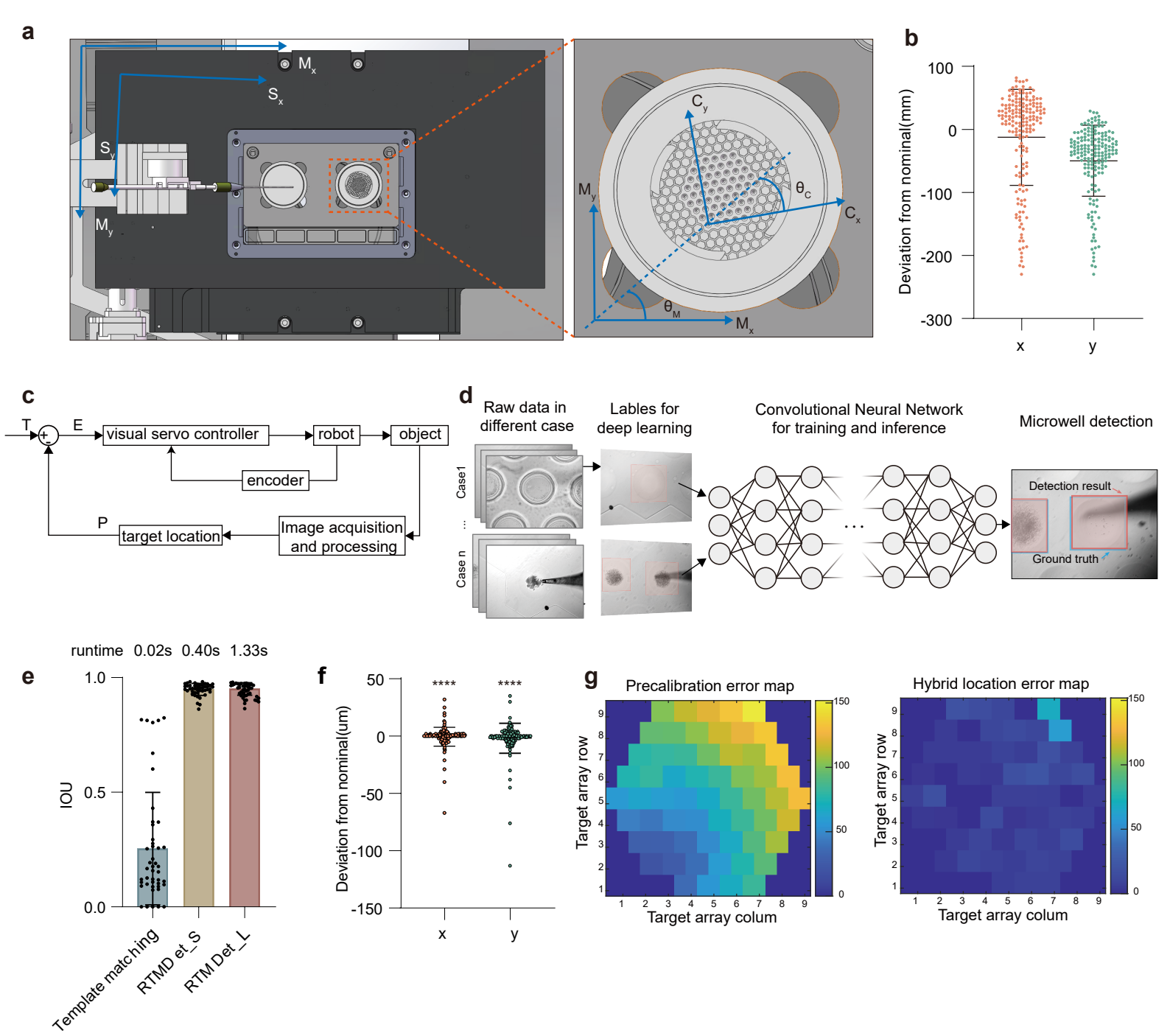
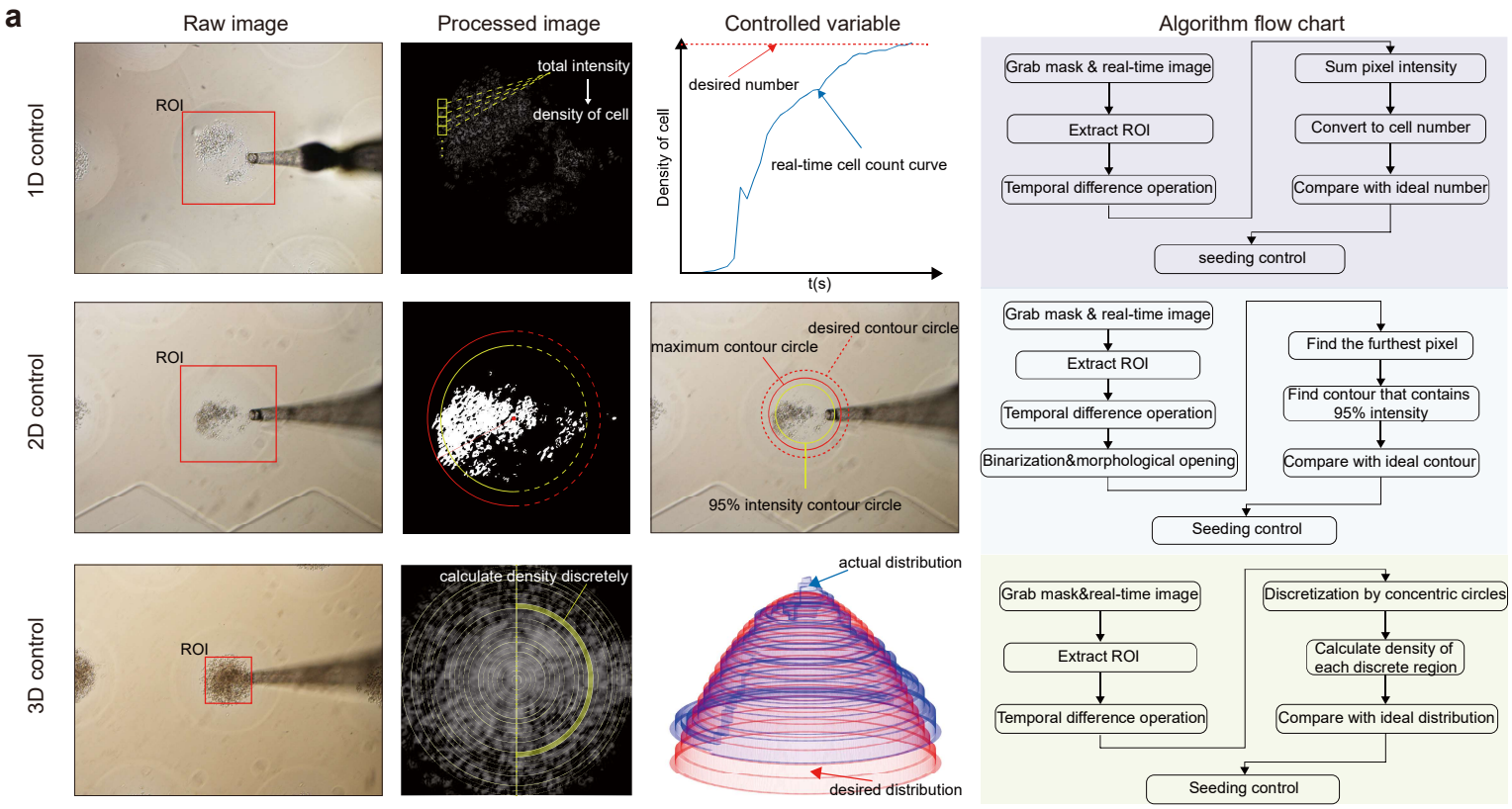
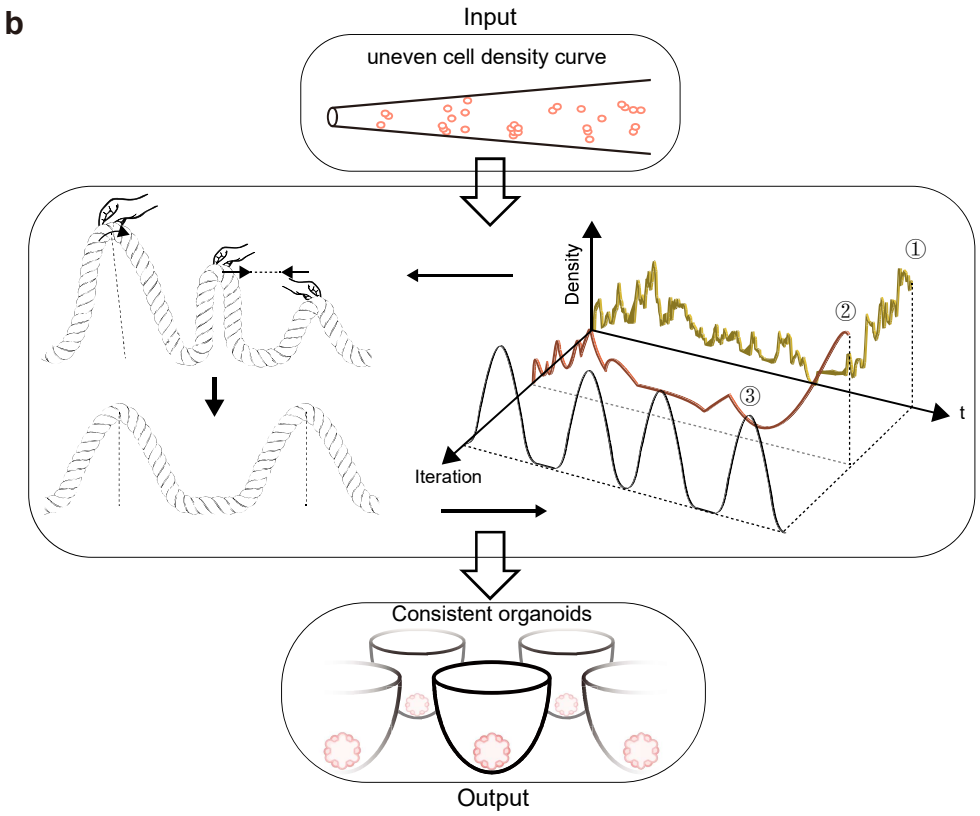
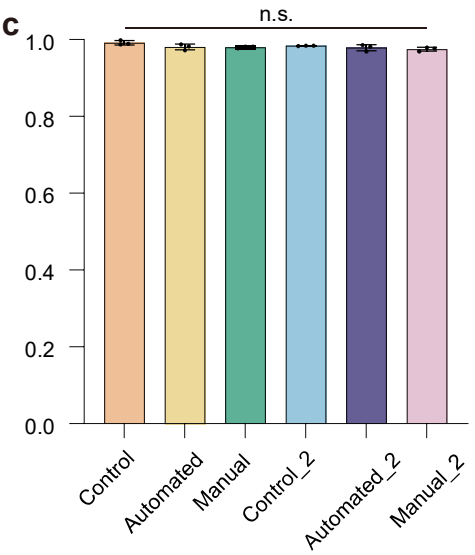
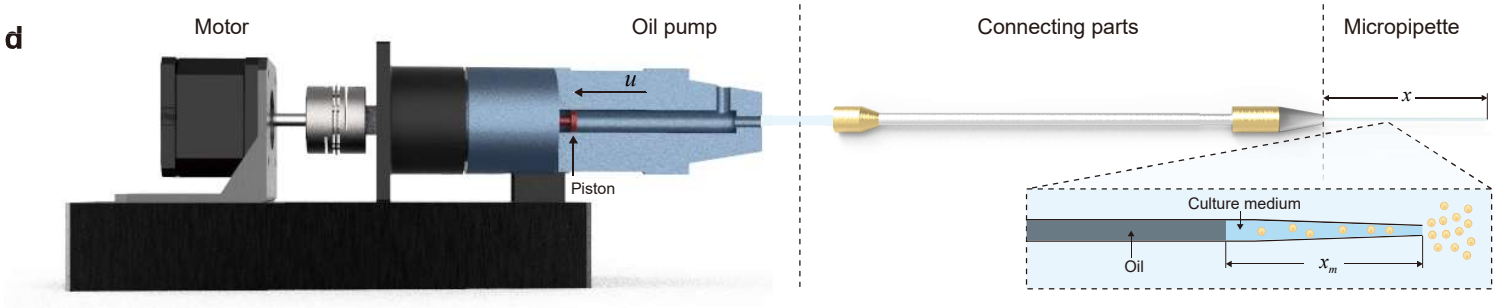


Supplementary Figure 4

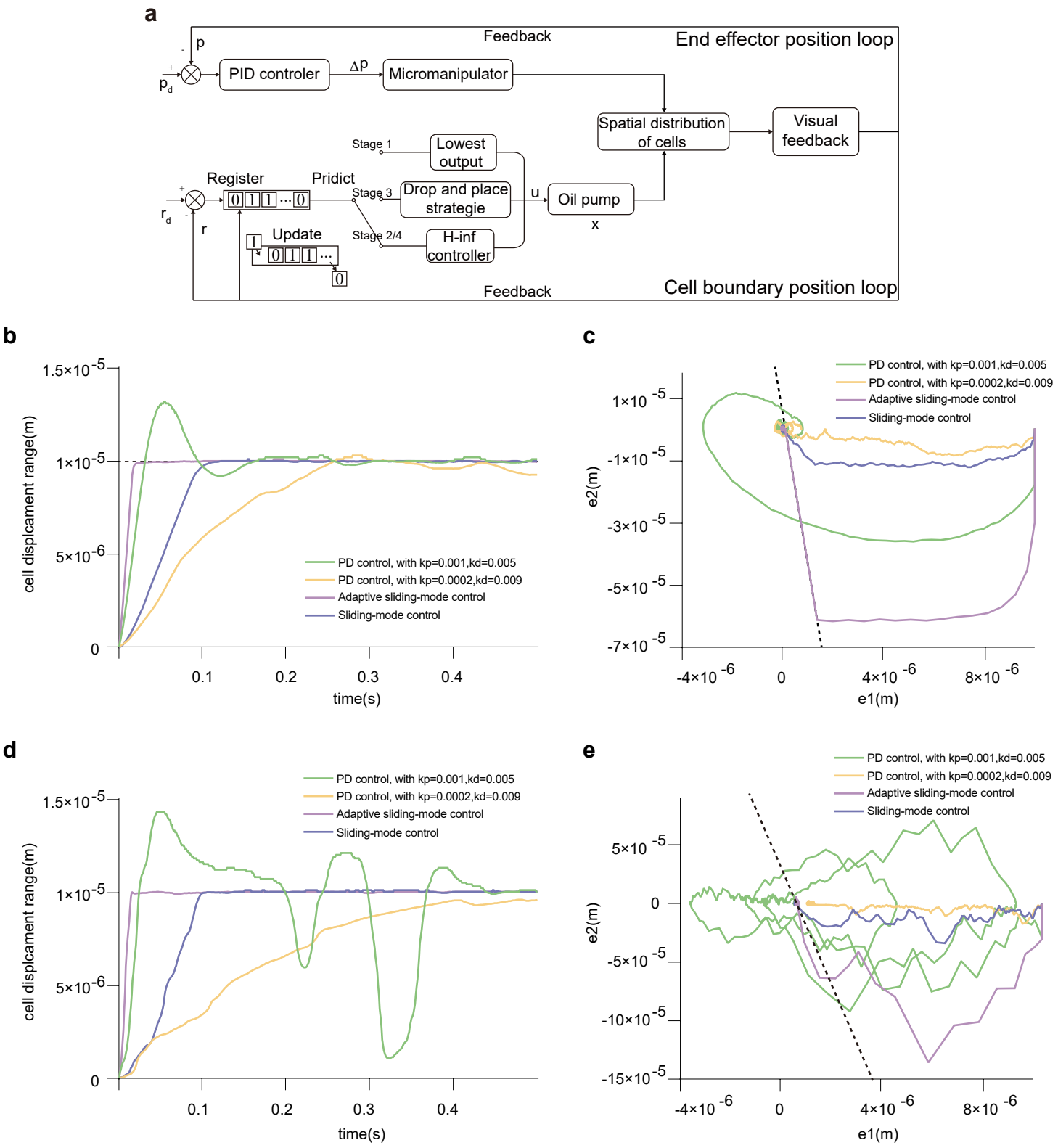


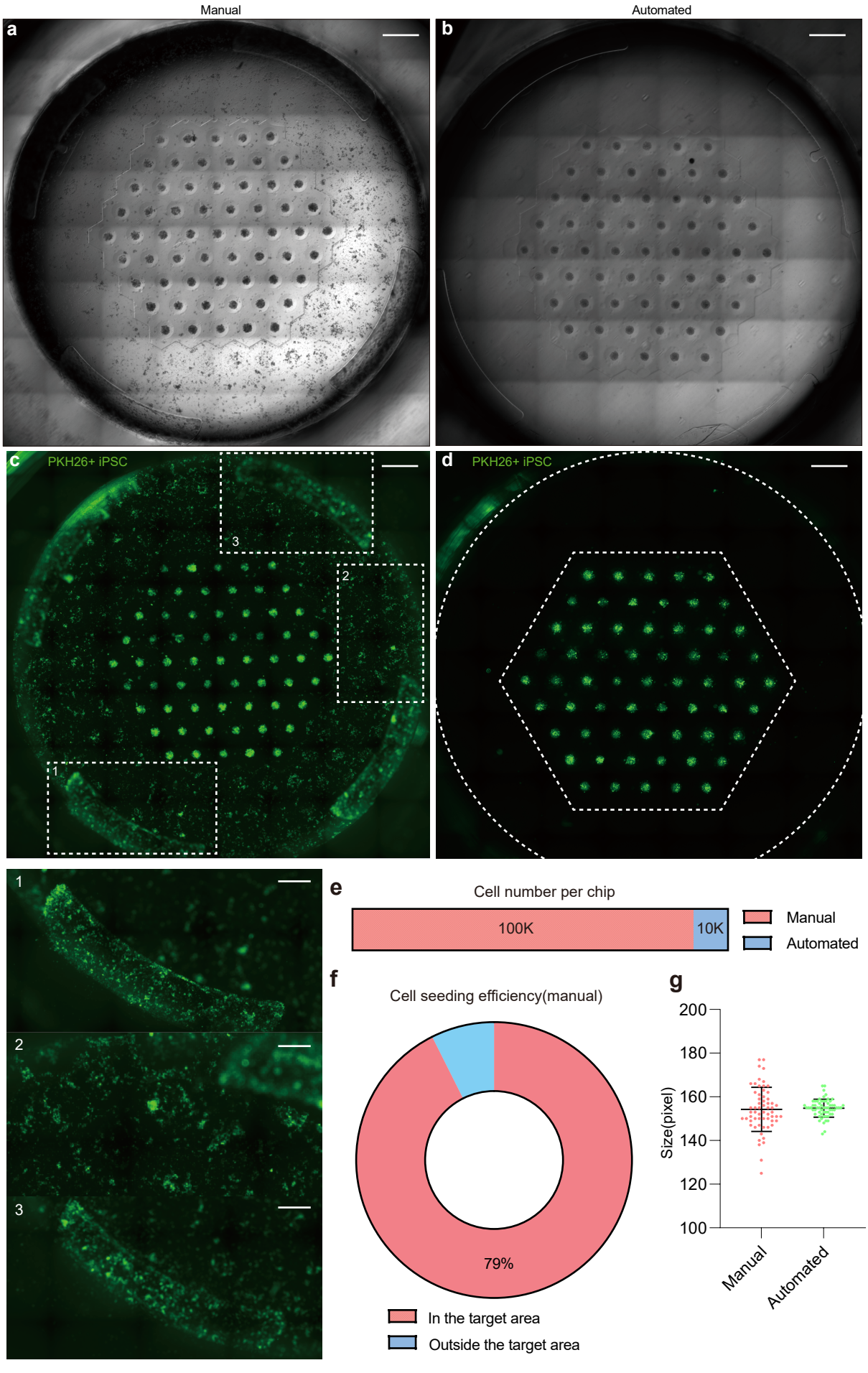




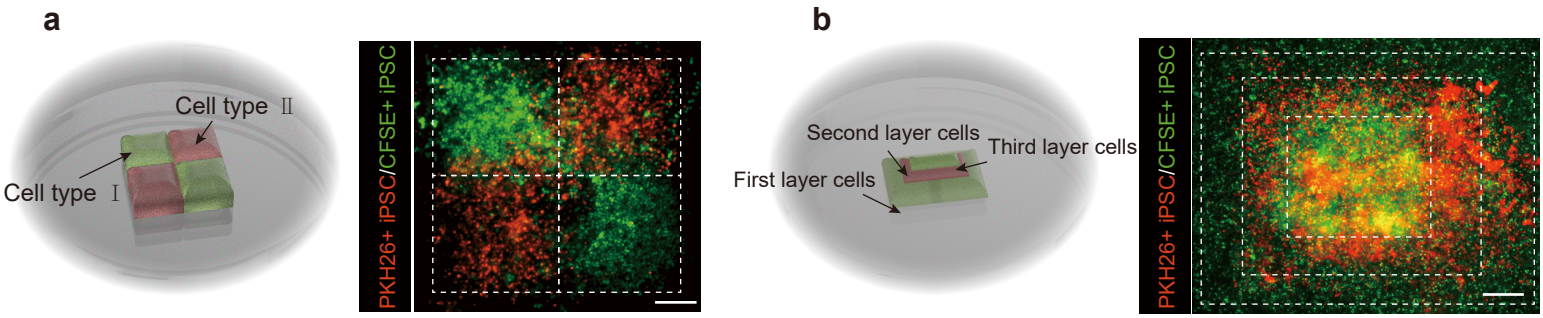


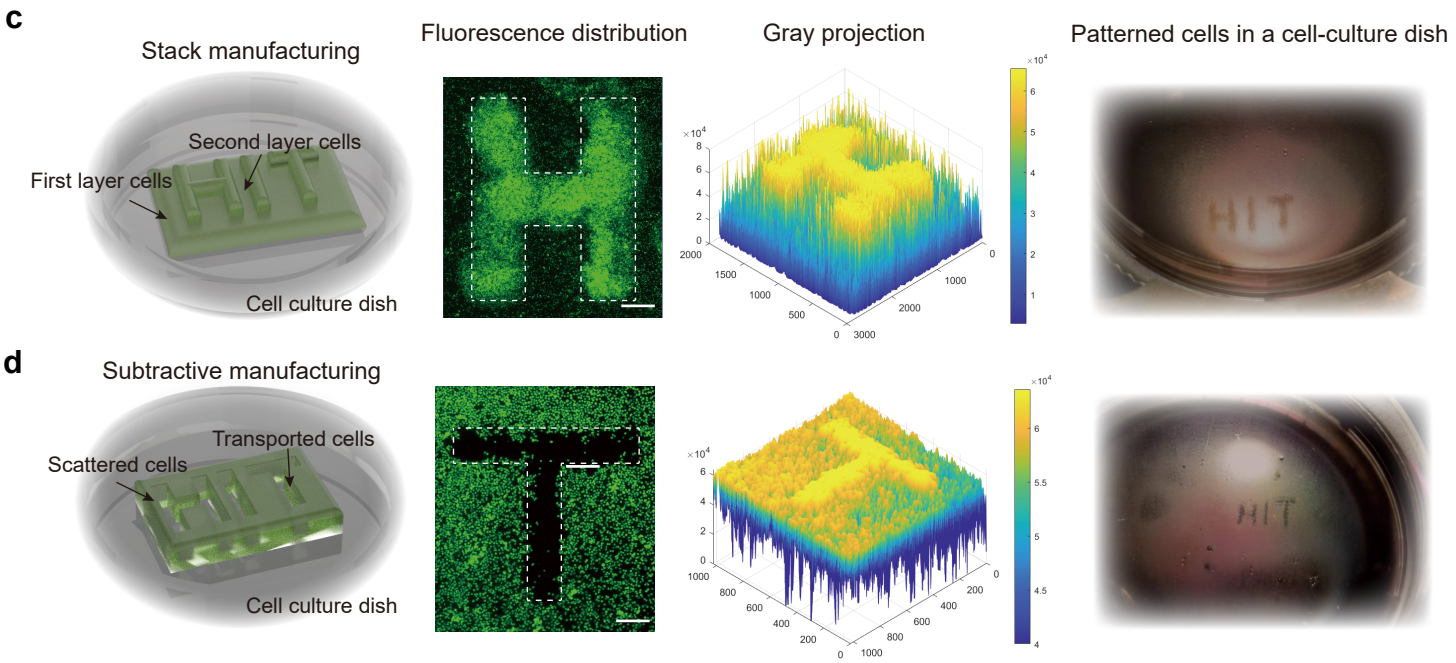
Supplementary Figure 5

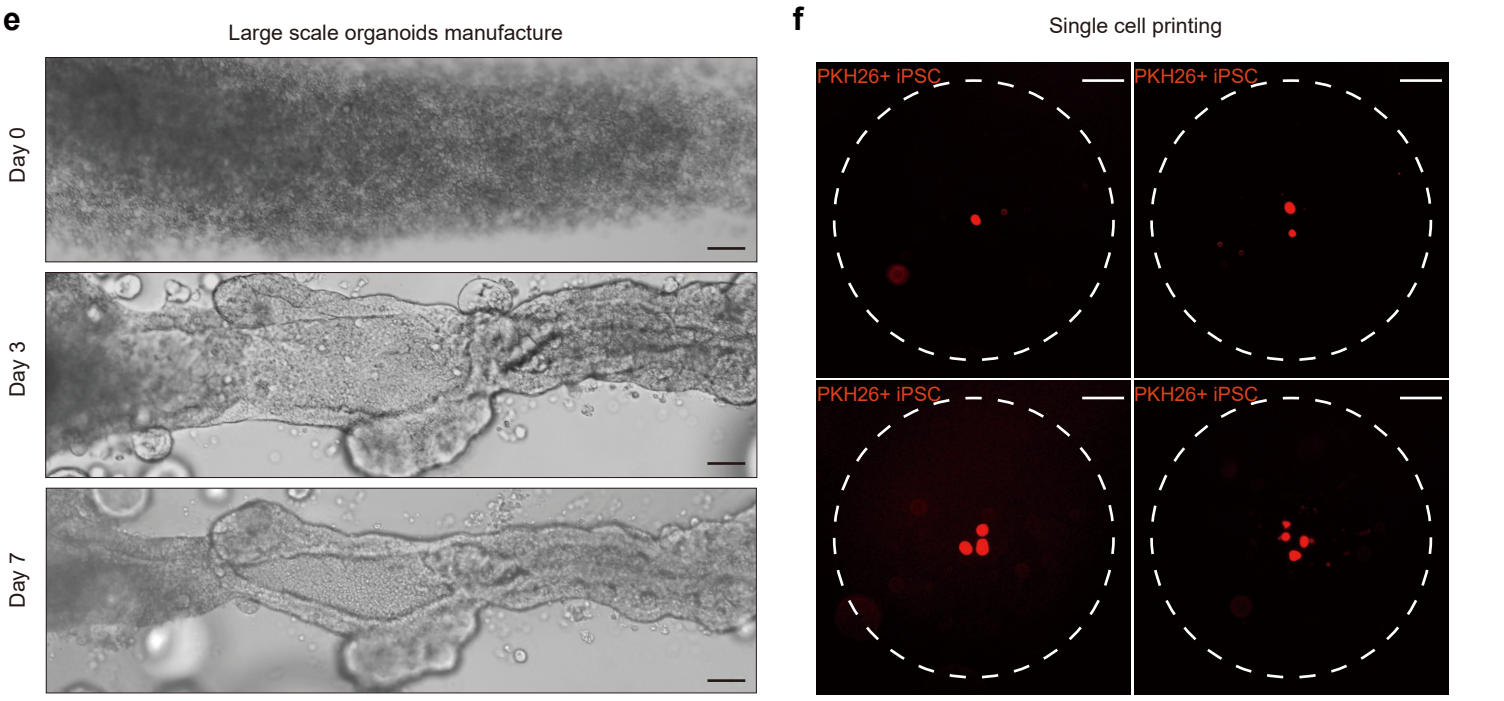

a
Feedback
End effector position loop
p
PID controler
Δp
Micromanipulator
Spatial distribution of cells
Visual feedback
Stage 1
Lowest output
Register
Pridict
Stage 3
Drop and place strategie
u
Oil pump
x
Update
Stage 2/4
H-inf controller
r
Feedback
Cell boundary position loop
b
cell displcament range(m)
time(s)
PD control, with kp=0.001,kd=0.005
PD control, with kp=0.0002,kd=0.009
Adaptive sliding-mode control
Sliding-mode control
c
e2(m)
e1(m)
d
e
Supplementary Figure 6



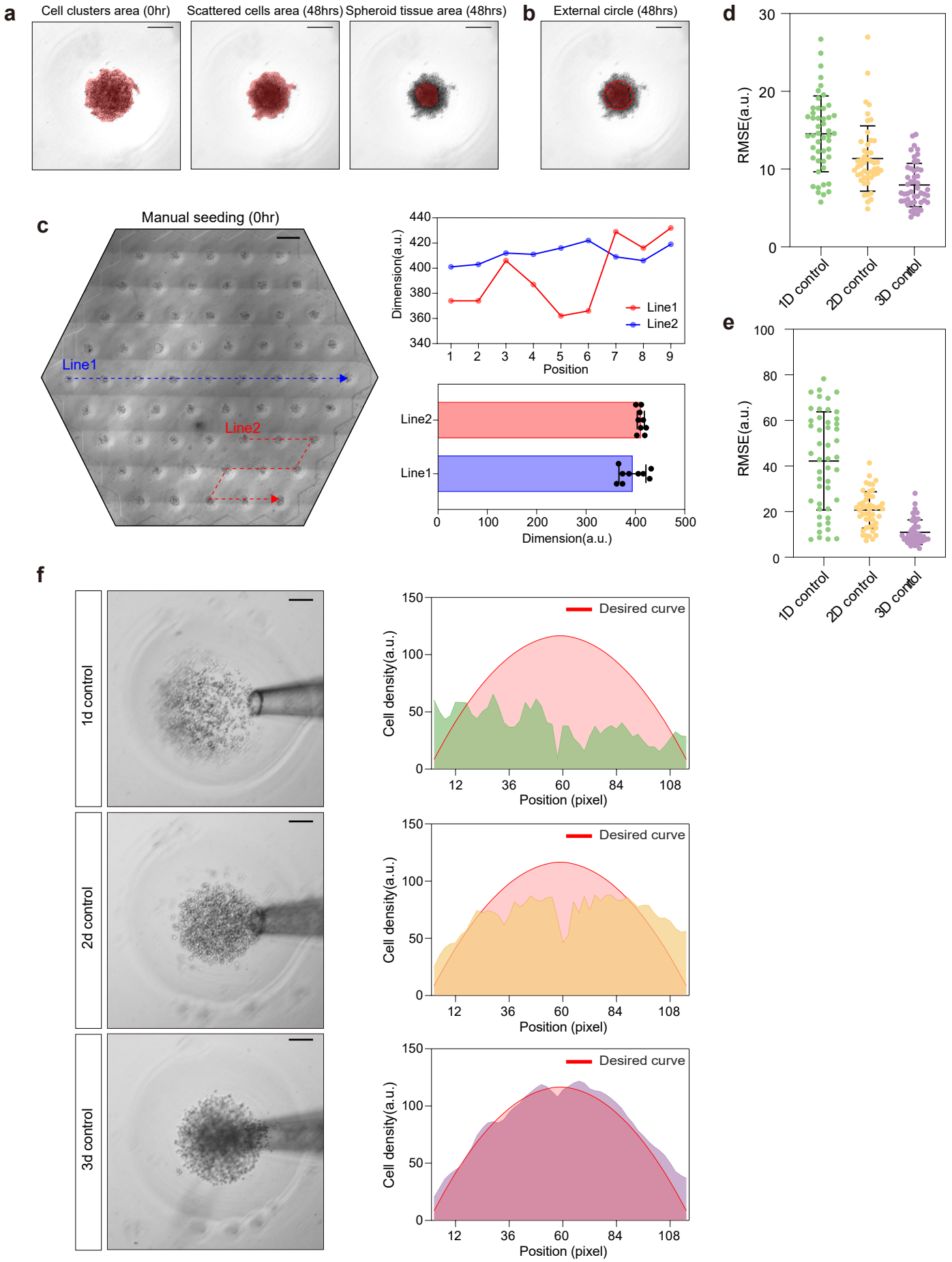
Supplementary Figure 7



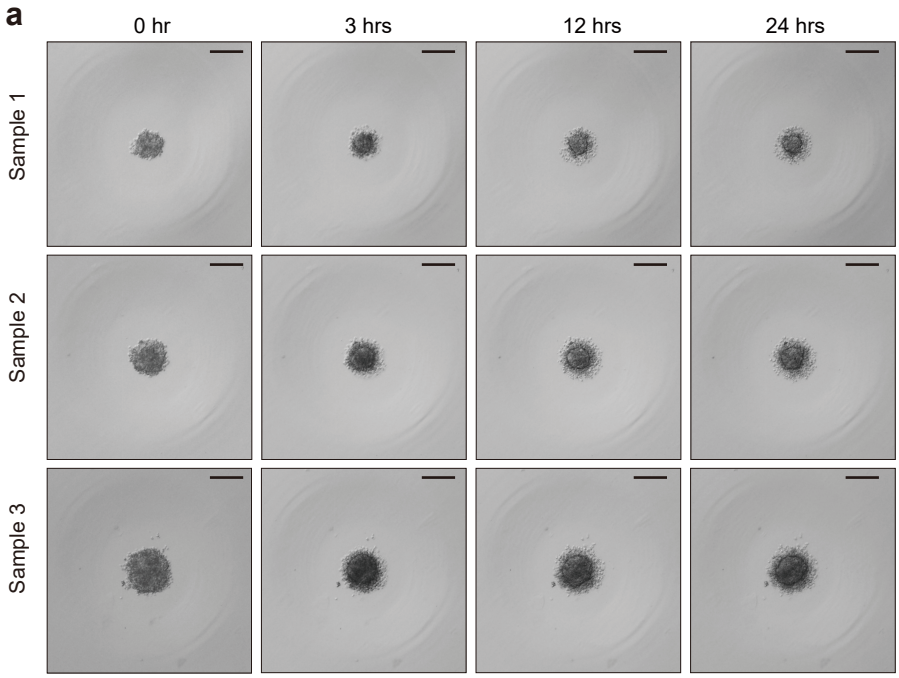




Supplementary Figure 8



Supplementary Figure 9



Supplementary Figure 10