Supplementary Information

Ultraportable and Rapid Solid Sample Preparation System Utilizing Twin-Screw Mechanism for Diagnostic Applications

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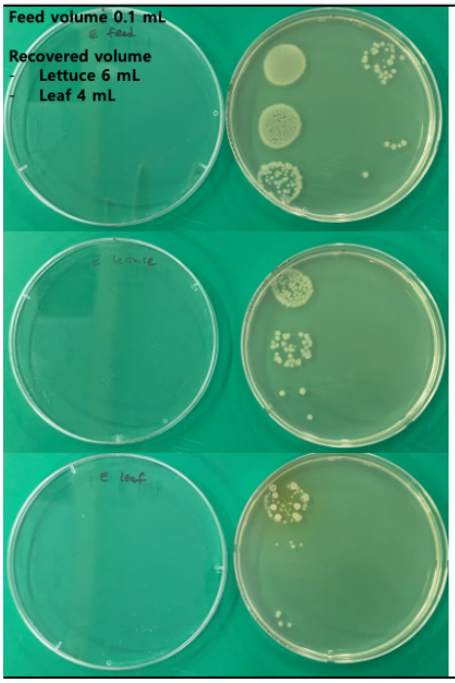
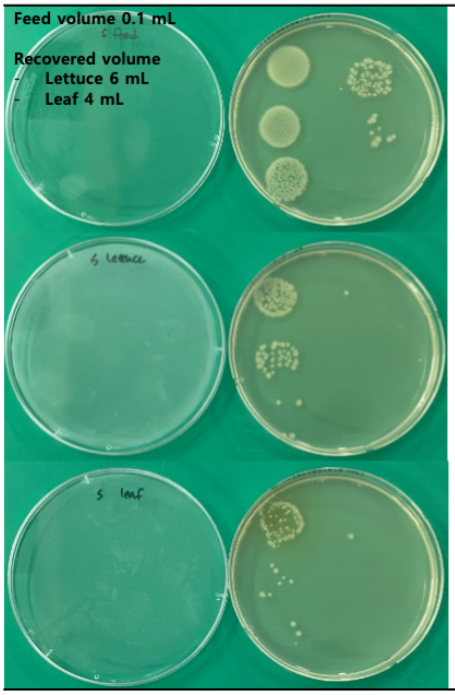
(a) *E. coli*



Sample type (volume)		Colony count [CFU/50 µL]	Concentration [CFU/mL]	Total bacteria [CFU/sample]
Feed (0.1 mL)	set 1	3.5×10^5	7.0×10^6	7.0×10^5
	set 2	4.0×10^5	8.0×10^6	8.0×10^5
Lettuce (6 mL)	set 1	3.7×10^3	7.4×10^4	4.44×10^5
	set 2	3.0×10^3	6.0×10^4	3.6×10^5
Leaf (4 mL)	set 1	5.2×10^2	1.04×10^4	4.16×10^4
	set 2	4.0×10^2	8.0×10^3	3.2×10^4

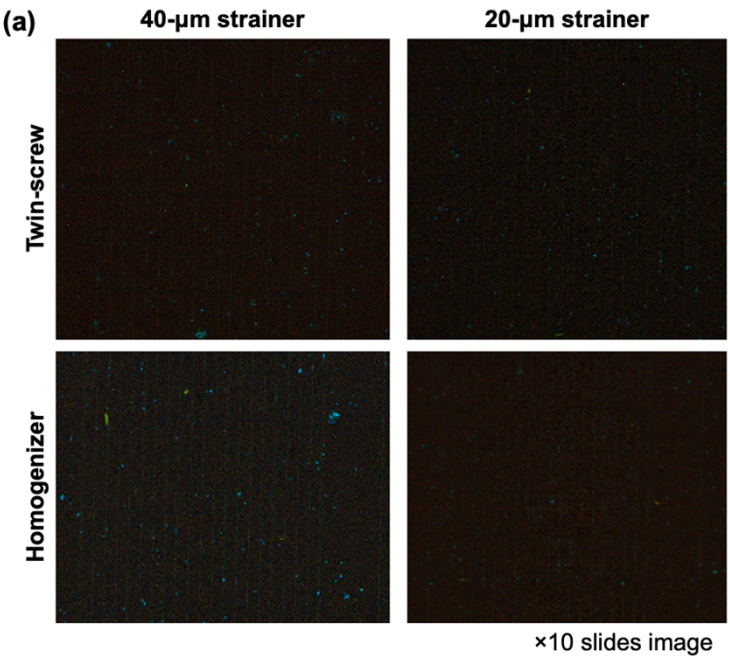
(b) *S. epidermidis*



Sample type (volume)		Colony count [CFU/50 µL]	Concentration [CFU/mL]	Total bacteria [CFU/sample]
Feed (0.1 mL)	set 1	9.0×10^5	1.8×10^7	1.8×10^6
Lettuce (6 mL)	set 1	4.3×10^3	8.6×10^4	5.16×10^5
	set 2	4.0×10^3	8.0×10^4	4.8×10^5
Leaf (4 mL)	set 1	8.7×10^2	1.74×10^4	6.96×10^4
	set 2	8.0×10^2	1.6×10^4	5.4×10^4

Figure S1. Agar plates showing colony-forming units (CFU) of (a) *E. coli* and (b) *S. epidermidis* recovered from lettuce and leaf samples after processing, along with the detailed colony counting results (raw data corresponding to Figure 2e in the article).

(a)

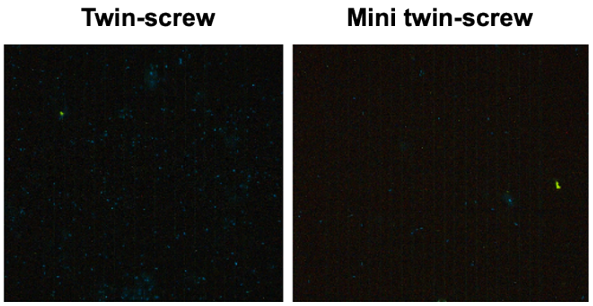


(b)

Cell types	40-μm strainer		20-μm strainer	
	Twin-screw	Homogenizer	Twin-screw	Homogenizer
Single cells	613.75 (99.35)	437.5 (13.44)	787 (164.05)	355.5 (71.42)
Doublets	93.5 (12.02)	116 (22.63)	129.5 (40.31)	21.5 (4.95)
Triplets	44.25 (5.30)	30.75 (1.06)	27 (4.24)	8.25 (11.67)
Clusters (>4 cells)	27 (9.90)	14.5 (2.12)	3 (4.24)	0 (0)
Sum	778.5	598.75	946.5	385.25

Figure S2. Cell counting process for evaluating the tissue dissociation efficiency of the twin-screw device and homogenizer (raw data corresponding to Figure 3d and 3e in the article): (a) Fluorescence microscopy images of dissociated tissue suspensions loaded onto a hemocytometer for counting DAPI-stained nuclei. (b) Quantitative analysis of cell types based on mean counts and standard deviations. Data are presented as Mean (Standard deviations).

(a)



×10 slides image

(b)

Cell types	Twin-screw	Mini twin-screw
Single cells	622	176
Doublets	198	16
Triplets	141	9
Clusters(>4 cells)	199	11

Figure S3. Cell counting process for evaluating the single cell ratio obtained by the twin-screw and miniaturized twin-screw modules (raw data corresponding to Figure 4c in the article): (a) Flourescence microscopy images of dissociated tissue suspension loaded onto a hemocytometer for counting DAPI-stained nuclei. (b) Quantitative analysis of cell types based on total counts.