Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

A Disposable Microcapsule Array Chip Fabricated by Ice Printing Combining with Isothermal Amplification for Salmonella DNA Detection

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Author Contributions

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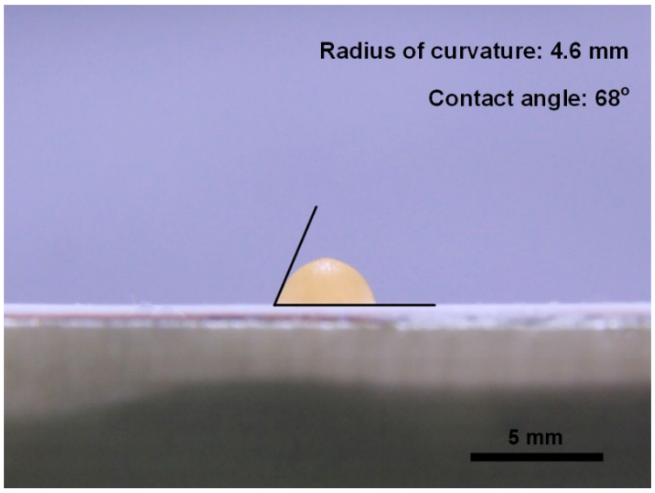

Figure S1 Radius of curvature and contact angle of the ice droplet.

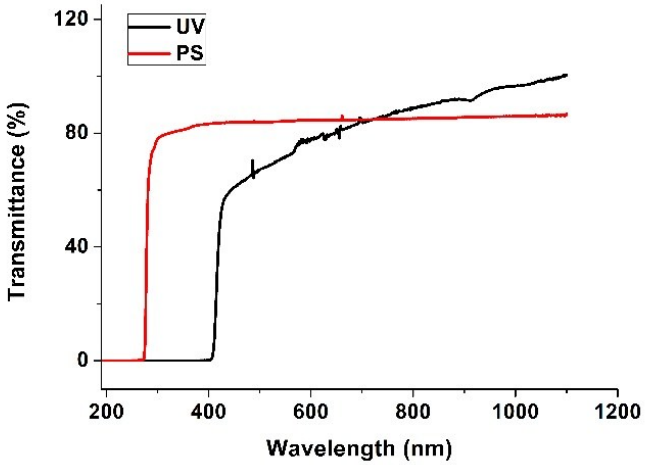

Figure S2 Transmittance of the UV and PS film.

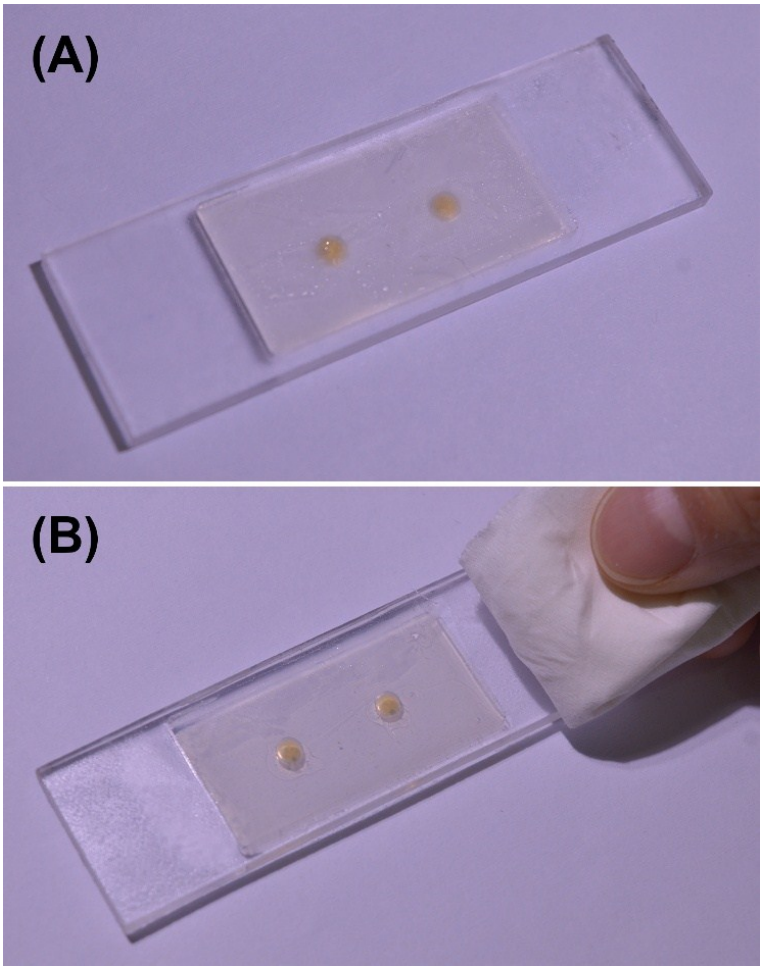

Figure S3 Real image of the thawing process. (A) Take the chip out of the freezer and keep it in room temperature until the ice thaws into liquid. (B) Wipe out the moisture condensed on the chip surface using paper towels.

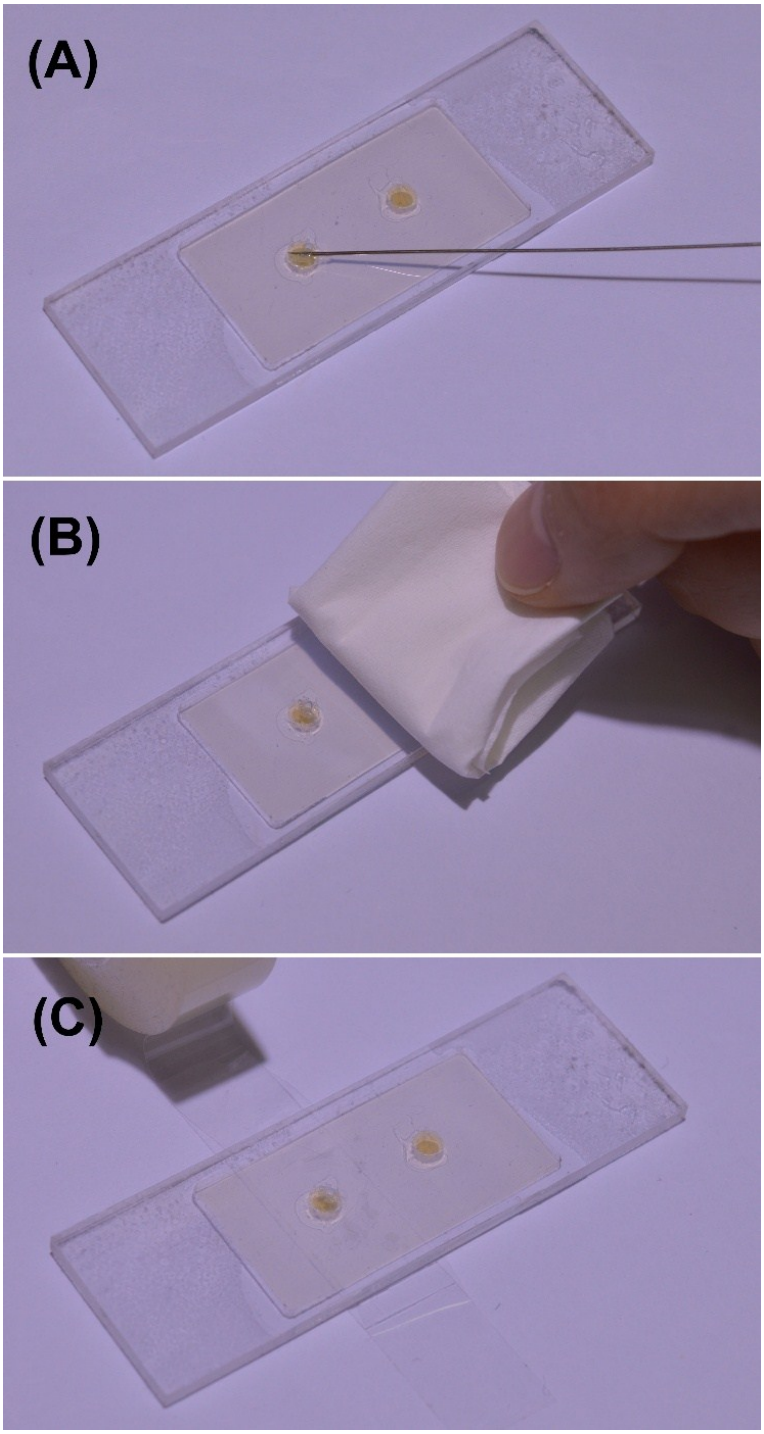

Figure S4 Real image of the injection process. (A) Place the chip with PET substrate side up. Then puncture the PET film with the needle and inject 1 μL target DNA solution. (B) If there is a little solution leaking out, use clean paper towel to wipe it out. (C) Seal the hole on the PET film by a commercial transparent tape.

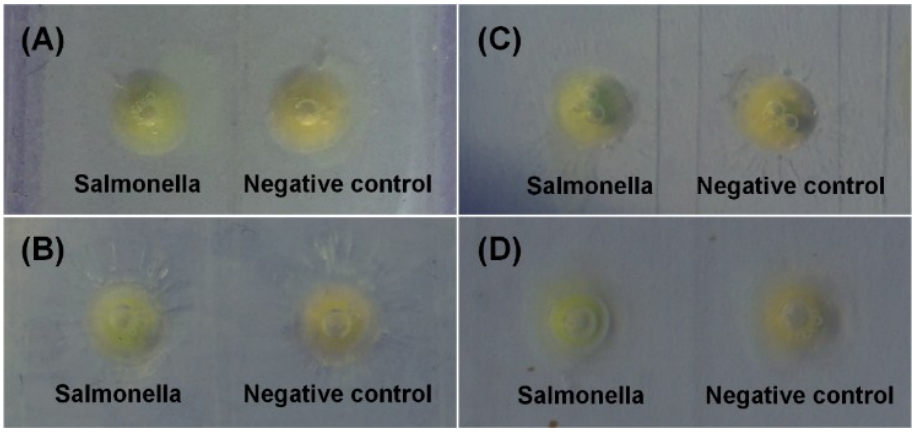

Figure S5 Stability test after storage at -20 °C for 0 day (A), 5 days (B), 10 days (C), 15 days (D). The concentrations of salmonella DNA, esch-erichia coli DNA and shigella DNA are all 10^5 copies. DNA-free water is used as negative control.

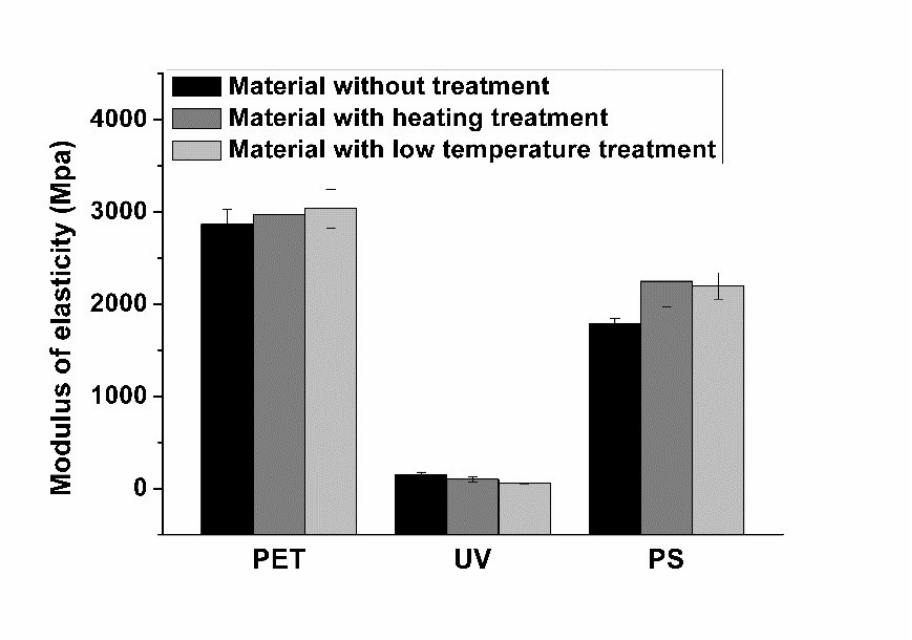

Figure S6 Stability test after storage at -20 °C for 0 day (A), 5 days (B), 10 days (C), 15 days (D). The concentrations of salmonella DNA, esch-erichia coli DNA and shigella DNA are all 10^5 copies. DNA-free water is used as negative control.

Table S1 Comparison of detecting limit of Salmonella detection method.

Method	Sensitivity	Ref.
Our method	60 copies/ μL	-
LAMP Sybr Green visual detection	4 copies/ μL	1
LAMP turbidity visual detection	40 copies/uL	1
LAMP gel visual detection	256 copies/uL	2
Conventional PCR	10570 copies/μL	3

Table S2 The cost of microcapsule array chip for Salmonella DNA detection.

Chip	**Price**	**Cost / Chip**
Basic structure (PET substrate & cofferdam)	10 $ /100 items	0.1 $
PS solution (PS particles and chloroform)	10 $ /500 mL	~0.1 $
Photopolymer (Loctite 3311)	100 $ /L	0.2 $
Reaction solution	**Price**	**Cost/Microcapsule**
Bst 2.0 WarmStart polymerase 10 × Isothermal Amplification buffer MgSO4 (100 mM)	100 $ /1600 polymerase units	0.3 $
DNA oligonucleotides	70 $	~0.1 $
Deoxynucleotide solution mixture	40 $ /4μmol	0.3 $
Calcein	10 $ /10g	~0.1 $
MnCl2	3 $ /500g	~0.1 $
Total cost **(One chip with two microcapsules)**	~2.2 $	

Table S3 Time used in chip fabrication and detection procedures.

Fabrication Procedures	**Time**
Ice Printing	5 sec/microcapsule
PS Film Solution Dropping	5 sec/microcapsule
PS Film Volatilization and Formation	20 min
Photopolymer Sealing	5 min
Total	~30 min
Detection Procedures	
Microcapsule thaw at room temperature	~1 min
Sample injection and transparent tape sealing	1 min/microcapsule
DNA Loop-mediated isothermal amplification (LAMP)	90 min
Results read by naked eyes	~5 sec
Total	~100 min

References:

1. J. L. Yang, G. P. Ma, R. Yang, S. Q. Yang, L. Z. Fu, A. C. Cheng, M. S. Wang, S. H. Zhang, K. F. Shen, R. Y. Jia, *J Appl. Microbiol*., 2010, **109**, 1715-1723.
2. C. Techathuvanan, F.A. Draughon, D.H. D'Souza, *J. Food Sci.*, 2010, **75**, M165-172.
3. J. Li, L. Zhai, X. Bie, Z. Lu, X. Kong, Q. Yu, F. Lu, C. Zhang, H. Zhao, *Food Control*, 2016, **60**, 230-236.