Supplementary Information

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

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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, escherichia 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/μL    | 1    |
| LAMP gel visual detection             | 256 copies/μL   | 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                                   | 10 $ /100 items     | 0.1 $       |
| (PET substrate & cofferdam)                       |                     |             |
| PS solution                                       | 10 $ /500 mL        | ~0.1 $      |
| (PS particles and chloroform)                     |                     |             |
| Photopolymer                                      | 100 $ /L            | 0.2 $       |
| (Loctite 3311)                                    |                     |             |
| **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                                | Time        |
|------------------------------------------------------|-------------|
| 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:

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