Electronic Supplementary Information

Dew inspired breathing-based detection of genetic point mutation visualized by naked eye

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SUPPLEMENTARY RESULTS

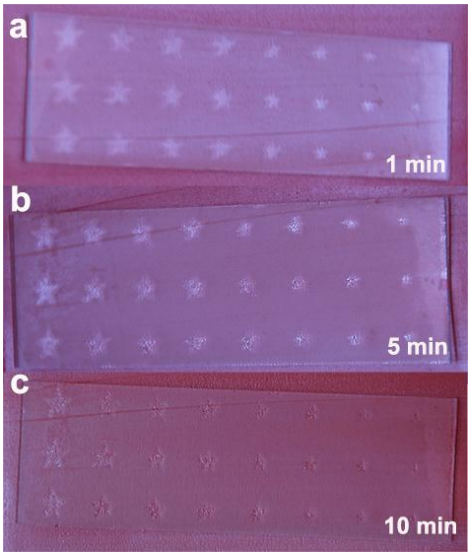

Figure S1 Images of hydrophilic and hydrophobic patterned glass slides with different time of vapor condensation on cold surface (humidity in air: 50%, temperature in air: 27 ^{o}C).

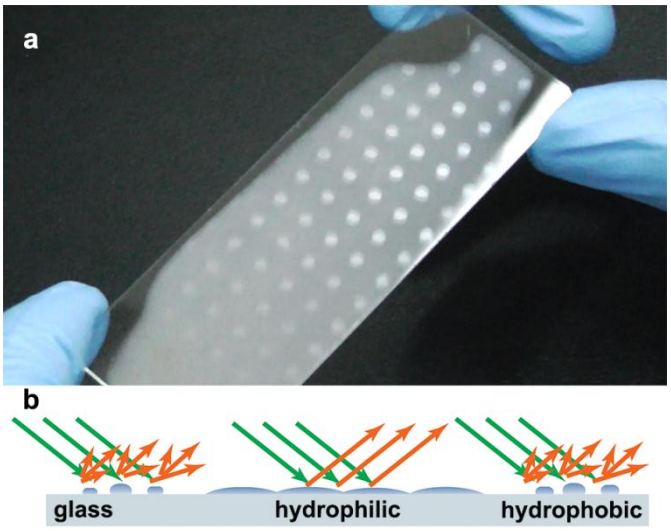

Figure S2 (a) Photo of a hydrophilic and hydrophobic patterned glass slide with breathing-induced vapor condensation. (b) Optical paths on the hydrophilic and hydrophobic patterned glass slide with vapor condensation.

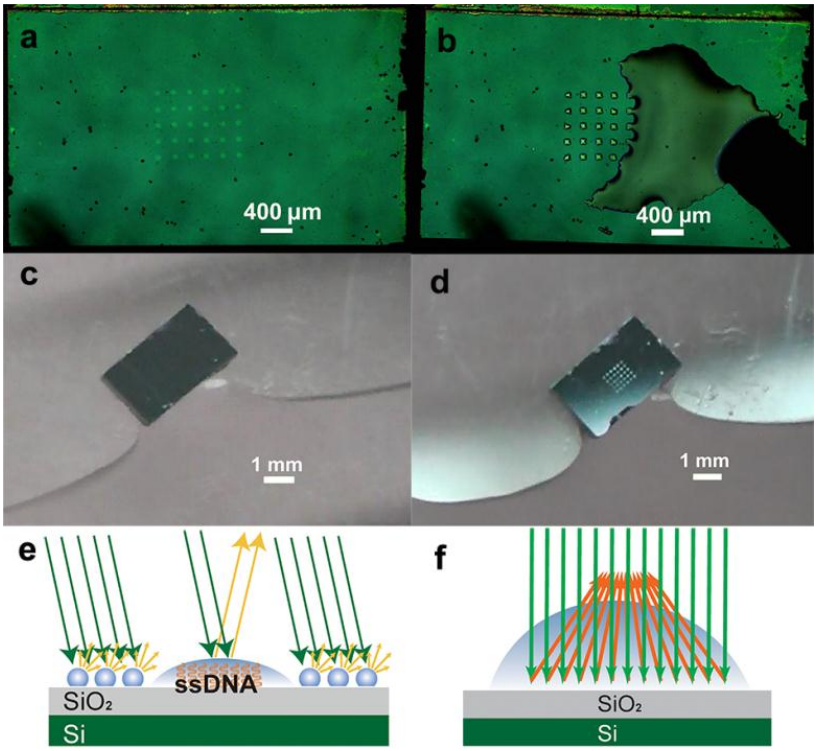

Figure S3 Microphotographs showing the altered hydrophilicity on the chip by RCA products. Chip with ssDNA networks amplified by RCA was visualized by vapor condensation caused by breathing (a) and by water auto-loading (b). Photos of the chip before (c) and after (d) incubation with water. (e) and (f) illustrate the optical paths of (a) and (b) respectively. The hydrophilic DNA networks absorb water easily. When excessive water was added onto the chip, it accumulated on the spots with RCA products, forming a big droplet. The big droplet acted as a semi-spherical lens which condensed the reflected beam above the droplet.

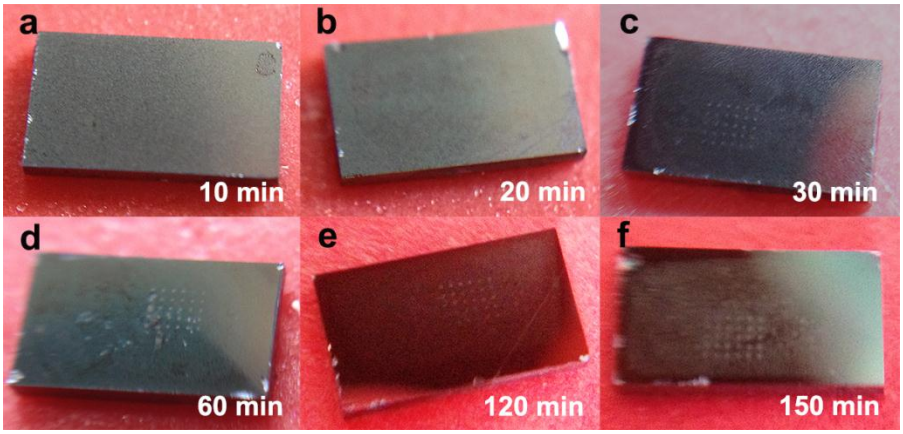

Figure S4 Photos of gene chip with different RCA reaction time, which were visualized by breathing-introduced vapor condensation and captured by a cell phone. (a) 10 min. (b) 20 min. (c) 30 min. (d) 60 min. (e) 120 min. (f) 150 min.

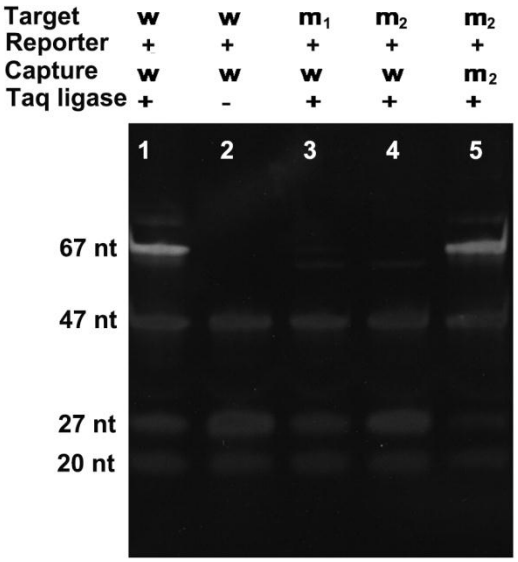

Figure S5 Analysis of target induced ssDNA ligation by gel electrophoresis. Letters indicate mutations (m_1 for G to C, m_2 for G to T) or wild type (w). The presence of reporter was indicated by plus (+) sign , and the presence or absence of Taq DNA ligase was indicated by plus (+) and minus (-) signs. The sequences of all ssDNA probes used here are listed in Table 1.

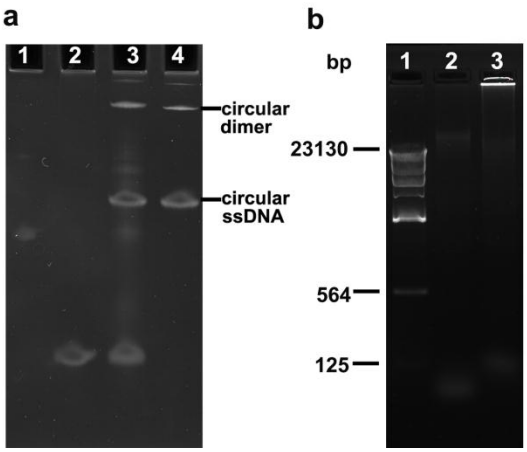

Figure S6 (a) Gel image of the circularization of the RCA template. (lane 1: template-2, lane 2: splint-2, lane 3: circular template without enzyme digest, lane 4 circular template with digest by EXO I and EXO III). (b) Gel image of the RCA products (lane 1: λ-Hind III digest DNA Marker (M), lane 2: in the absence of reporter probe (-R), lane 3 in the presence of reporter probe (+R)).

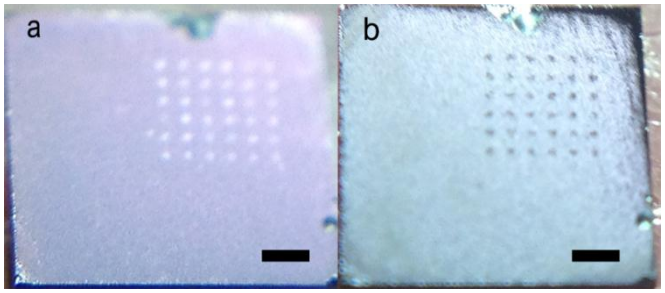

Figure S7 Photos of the RCA-amplified chips captured from different detection angles by a cell phone. (a) The observing angle and the illuminating angle are symmetrical. (b) The observing angle and illuminating angle are not symmetrical. The scale bars are 400 μm.

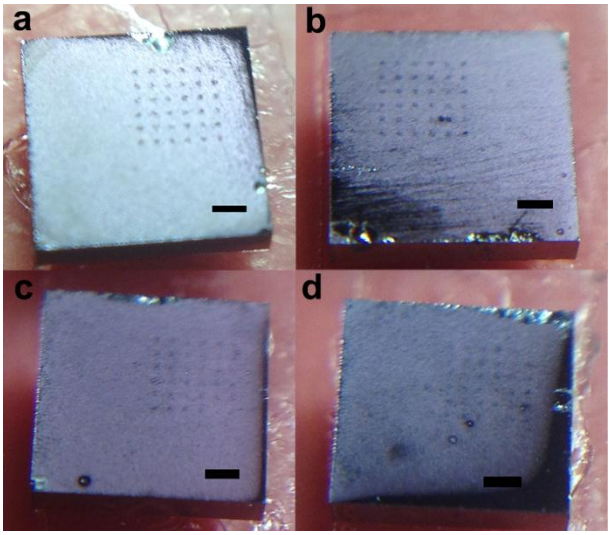

Figure S8 Photos of the RCA-amplified chip with different concentrations of point mutation (AGG→AGC) sequences, which were visualized by vapor condensation via breathing and captured by a cell phone. (a) 1 μM. (b) 0.1 μM. (c) 0.01 μM. (d) 1nM. The scale bars are 400 μm.

Table S1 The ssDNA sequences

Name	Sequence（5’→3’）	Modification
Splint-1	TTTTTTTTTTACCCCAACCTTCCCACTCCCTTTAATTTTTTTTTATTTT	5'-NH_2-$(CH_2)_6$
Control splint	TTTTTTTTTTTGTTAGTGAGTTTAGTTGGCATGTGTAGATTATTTTAT	5'-NH_2-$(CH_2)_6$
Template-1	GGGAGTGGGAAGGTTGGGGTAAAACGGCTAAGGAGGAGACCCTGAACAGCCACCGAACTATCCTCCTAACACGACTAAAAATAAAAAAAAATTAAA	5'-PO_4
Template-2	GATTGATGATTTTTTTTTTTTTTTTTTTTTTTTTTTTTCGTAATTGCTCA	5'-PO_4
Splint-2	ATCATCAATCTGAGCAATTAC	
249wtAGG	GGCATGAACCGGAGGCCCATCCTCACC	
249muAGC	GGCATGAACCGGAGCCCCATCCTCACC	
249muAGT	GGCATGAACCGGAGTCCCATCCTCACC	
Reporter probe	CTCCGGTTCATGCCTTTTTTTTTTATCATCAATCTGAGCAATTACGA	5'-PO_4
249AGCcaptu (capture probe)	TTTTTTGGTGAGGATGGGG	5'-PO_4
249AGTcaptu (capture probe)	TTTTTTGGTGAGGATGGGA	5'-NH_2-$(CH_2)_6$
249captu (capture probe)	TTTTTTGGTGAGGATGGGC	5'-NH_2-$(CH_2)_6$

Video legends

Video S1 Vapor condensation on a hydrophilic-hydrophobic patterned glass slide by increasing humidity using a humidifier

Video S2 Vapor condensation on a hydrophilic-hydrophobic patterned glass slide by breathing

Video S3 Image contrast of the patterned glass exhibited different appearances by varying the observation angles in the reflection mode

Video S4 Chip with ssDNA networks amplified by RCA was visualized by vapor condensation caused by water auto-loading, and was recorded by a microscope

Video S5 Chip with ssDNA networks amplified by RCA was visualized by vapor condensation caused by water auto-loading, and was recorded by a camera

Video S6 Chip with ssDNA networks amplified by RCA was visualized by vapor condensation caused by breathing

Video S7 DNA array chip for screening liver cancer related genetic point mutation was visualized by vapor condensation via breathing and captured by a cell phone