Supplementary Materials

Rapid COVID-19 Molecular Diagnostic System Using Virus Enrichment Platform

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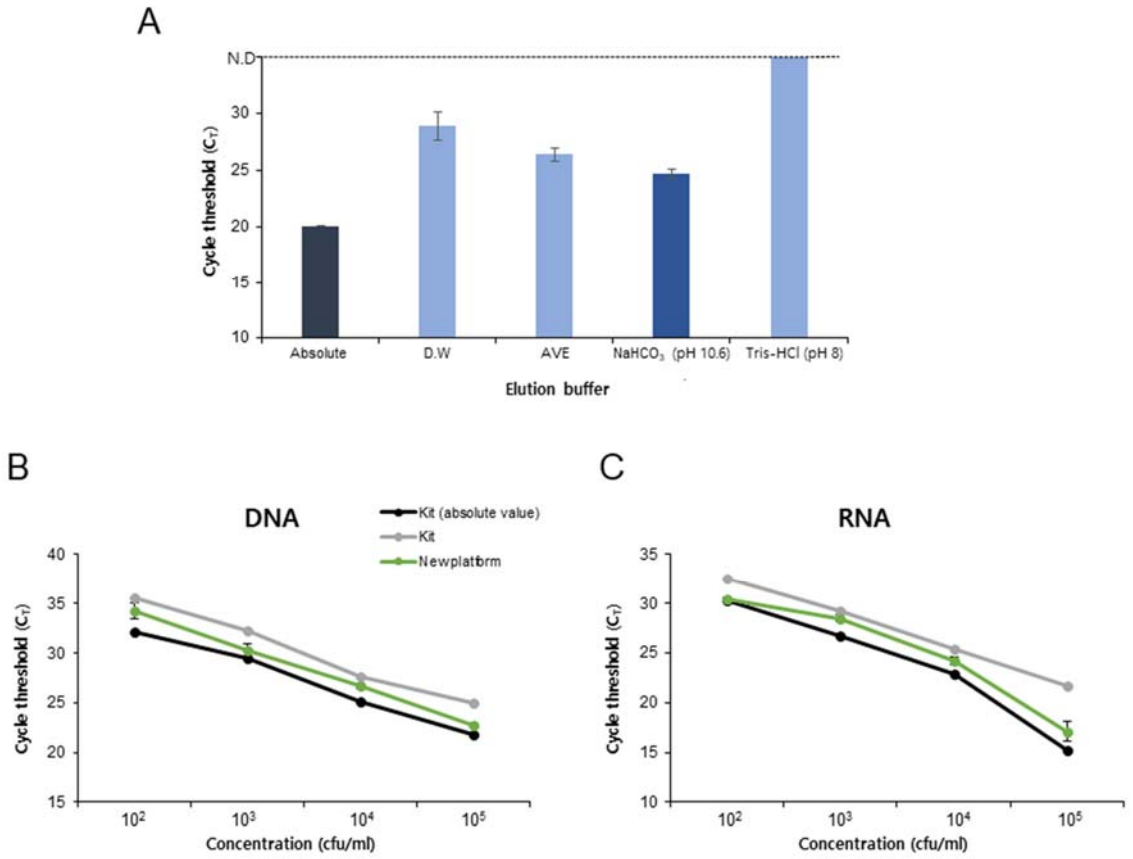

Figure S1. Application of DMP-PVDF filter platform for pathogen enrichment and extraction. (A) The efficiency of DMP-PVDF filter platform for pathogen extraction is dependent on the elution buffer. The positive control (gray) was DNA extracted from *E. coli* (10^5 CFU/mL) using a Qiagen kit. The highest amplification efficiency of the elution buffer on the DMP-PVDF filter platform was seen the 10 mM

$NaHCO_3$ (pH 10.6, dark blue). (B and C) Concentration for (B) DNA or (C) RNA extraction to process test in concentrations ranging from 1 × 10^2 to 1 × 10^5 CFU/mL using both the NA extraction only without enrichment using a Qiagen kit (gray) and the new platform (light green). White color denotes NA extracted from the absolute concentration sample of using a Qiagen kit. The data are presented as mean ± SD, based on at least three independent experiments. DMP, dimethyl pimelimidate; PVDF, polyvinylidene fluoride; $NaHCO_3$, sodium bicarbonate; NA, nucleic acid; SD, standard deviation.

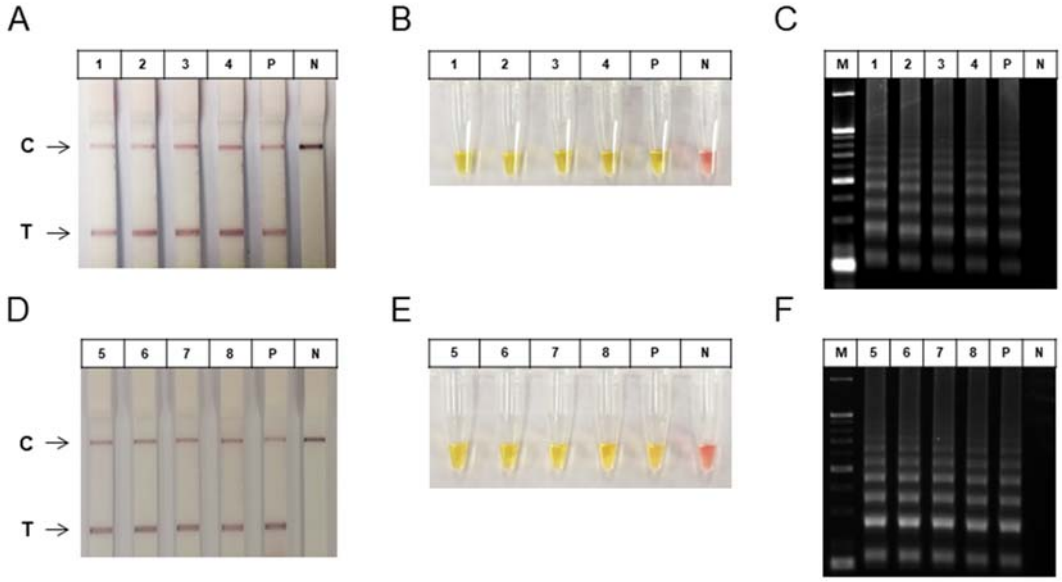

Figure S2. Optimization of RT-LAMP primers for SARS-CoV-2 detection. RT-LAMP was performed using synthetic RNA for S and N genes of SARS-CoV-2. (A-C) RT-LAMP with the S gene LAMP primers could detect the viral RNA (5.85 × 10^9 to 5.85 × 10^6 per reaction). (A) RT-LAMP with LFA, (B) colorimetric-LAMP, and (C) agarose gel electrophoresis of the reaction products. (D-F) RT-LAMP with the N gene LAMP primers could detect the viral RNA (2.33 × 10^9 to 2.33 × 10^6 per reaction). (D) RT-LAMP with LFA, (E) colorimetric-LAMP, and (F) agarose gel electrophoresis of reaction products. All RT-LAMP reactions were performed at 65 °C for 60 min. RT, reverse transcription; LAMP, loop-mediated isothermal amplification; S, spike; N, nucleocapsid; LFA, lateral flow assay; M, size marker; P, positive control; N; negative control; T, target; C, control.

Table S1. Primer sequences.

Primer	Sequences 5′-3′
E.coli-F	CAACGAACTGAACTGGCAGA
E.coli-R	CATTACGCTGCGAGGAT
Brucella-F	GCTTGAAGCTTGCGGACAGT
Brucella-R	GGCCTACCGCTGCGAAT
N gene T7-Fragment-F	TTTGGTGGACCCTCAGATTC
N gene T7-Fragment-R	TTGGCAATGTTGTTCCTTGA
S gene T7-Fragment-F	AGAACTCAATTACCCCCTGCAT
S gene T7-Fragment-R	CGAAAAACCCTGAGGGAGAT
N gene RT-qPCR-F	TGGCAGTAACCAGAATGGAGAAC

N gene RT-qPCR-R	AGTGAGAGCGGTGAACCAAGA
N gene RT-qPCR-P	FAM-CGCGATCAAAACAACGTCGGCC-BHQ_1
S gene RT-qPCR-F	TCCGCATCATTTTCCACTTTTAA
S gene RT-qPCR-R	AAGTCAGACAAATCGCTCCAGGGCAAA
S gene RT-qPCR-P	CY5-TAACGCAGCCTGTAAAATCATCTG-BHQ_2
N gene RPA-F	AATAAGCATATTGACGCATACAAAACATTC
N gene RPA-R	AGGCCTGAGTTGAGTCAGCACTGCTCATGGATTGT
N gene HDA-F	TCACTCAACATGGCAAGGAAGACCTTA
N gene HDA-R	CGAATTCGTCTGGTAGCTCTTCGGTAG
S gene LAMP-F3	TCTTTCACACGTGGTGTT
S gene LAMP-B3	GTACCAAAAATCCAGCCTC
S gene LAMP-FIP	CATGGAACCAAGTAACATTGGAAAATTTTCCTGACAAAGTTTTCAGATCC
S gene LAMP-BIP	CTCTGGGACCAATGGTACTAAGAGTTTTGACTTCTCAGTGGAAGCA
S gene LAMP-LF	GAAAGGTAAGAACAAGTCCTGAGT
S gene LAMP-LB	CCCTGTCCTACCATTTAATGATGG
N gene LAMP-F3	TGGCTACTACCGAAGAGCT
N gene LAMP-B3	TGCAGCATTGTTAGCAGGAT
N gene LAMP-FIP	TCTGGCCCAGTTCCTAGGTAGTTTTTGACGAATTCGTGGTGGTGA
N gene LAMP-BIP	AGACGGCATCATATGGGTTGCATTTTGCGGGTGCCAATGTGATC
N gene LAMP-LF	ACCATCTTGGACTGAGATCTTTCA
N gene LAMP-LB	GAGGGAGCCTTGAATACACCA

F, forward; R, reverse; P, probe; F3, forward outer primer; B3, backward outer primer; FIP, forward inner primer; BIP, backward inner primer; LF, loop forward primer; LB, loop backward primer; N, nucleocapsid; S, spike; RPA, recombinase-based polymerase amplification; HDA, helicase-dependent amplification; LAMP, loop-mediated isothermal amplification