

**Supporting information**

**Naked-eye detection of pandemic Influenza A (pH1N1) virus by polydiacetylene (PDA)-  
based paper sensor as a point-of-care diagnostic platform**

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Lim<sup>a,b,\*</sup>

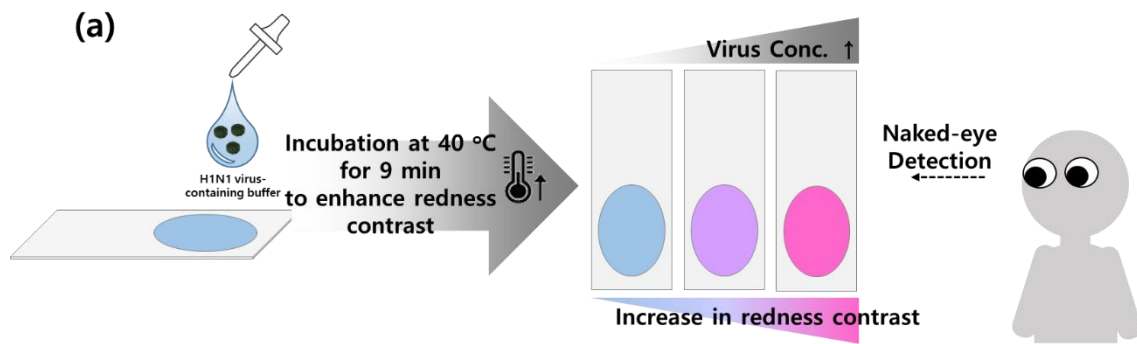
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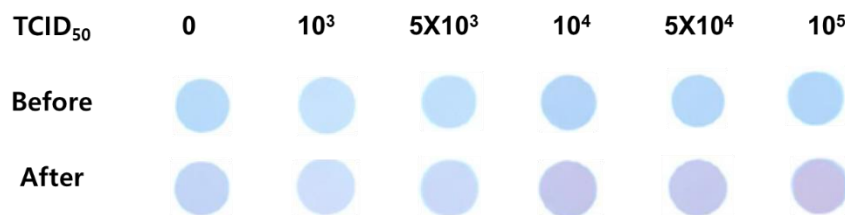
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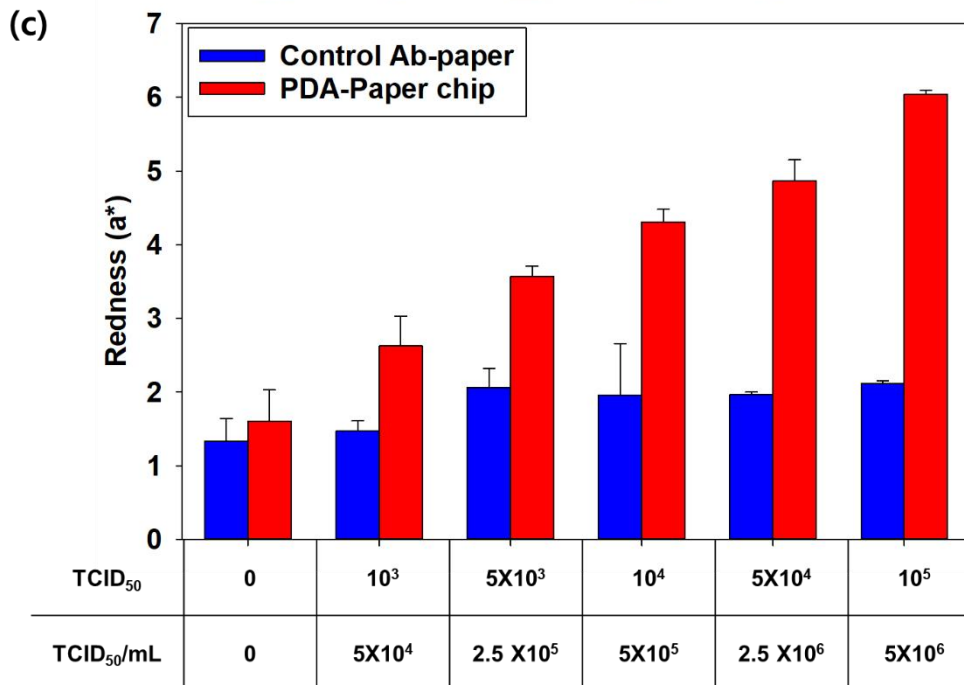
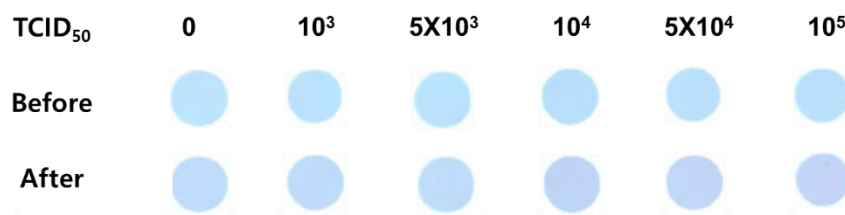
<sup>e</sup>These authors contributed equally to this work



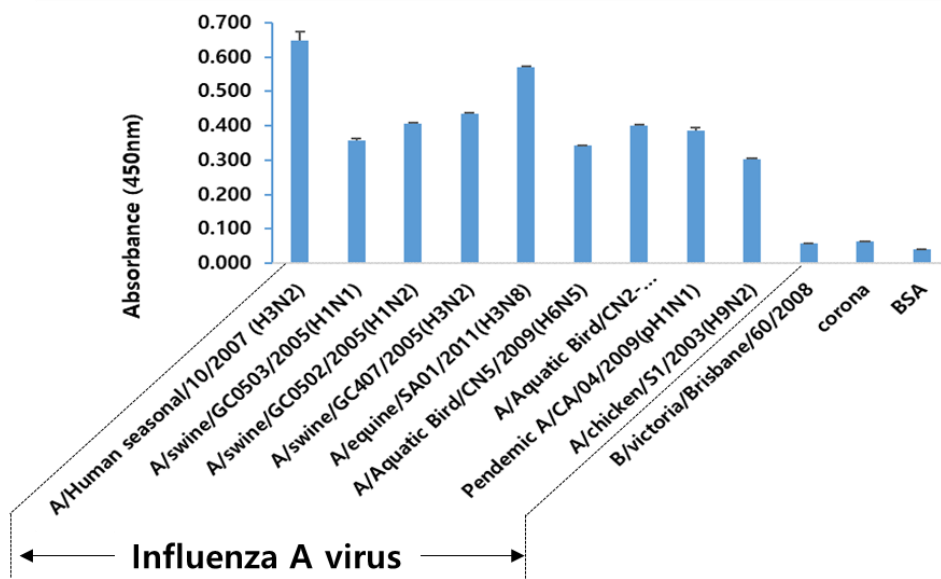
(b) (i) PDA-paper chip



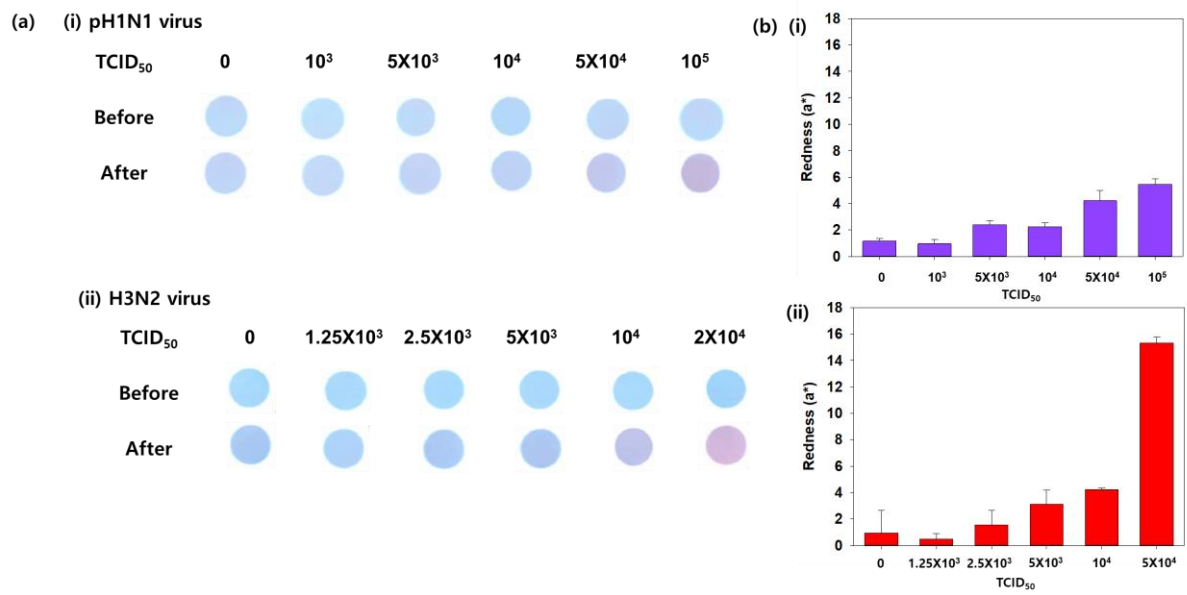
(ii) Control Ab-paper



**Figure S1.** (a) PDA-paper chips after pH1N1 virus containing buffer treatment further incubated at 40 °C for 9 min to enhance redness contrast. (b) Their color transition images (i: PDA-paper chip and ii: control Ab-paper) and (c) their redness (a\*) values (PDA-paper chip: red and control Ab-paper: blue).



**Figure S2.** Evaluation of the specificity of virus detection using NP antibody in ELISA. All viruses were provided by H-GUARD.



**Figure S3.** (a) Color transition images of (i) pH1N1 virus and (ii) H3N2 virus using PDA-paper chip, respectively, and (c) their redness ( $a^*$ ) values after detection (i: pH1N1 virus detection, ii: H3N2 virus detection).

<b>Influenza Diagnostic tests</b>	<b>Method</b>	<b>Assay time</b>	<b>Sensitivity</b>	<b>Strength</b>	<b>Weakness</b>
<b>Rapid influenza diagnostic test (Lateral flow assay; :LFA)</b>	Antigen detection	0.5 hour	10-70%	Fast, simple test without technical expertise and infrastructure	1)Low sensitivity, 2)Unavailable for distinguishing influenza A subtype
<b>Direct and indirect immunofluorescence assays (DFA and IFA)</b>	Antigen detection	2 – 4hour	47-93 %	Rapid assay time	Need for specialized tools
<b>Viral isolation in tissue cell culture</b>	Conventional culture	2 – 10 days	~ 100 %	High specificity and sensitivity	1) Less sensitive detection than PCR-based assay, 2) Relatively long detection time, 3) Unavailable for immediate patient care
<b>Nucleic acid amplification tests (including rRT-PCR)</b>	RNA detection	48 – 96 hours (6 - 8 hours to perform test)	86 – 100 %	High specificity and sensitivity, great reproducibility	Expensive, need for specialized tools or technical expertise

**Table S1.** Comparison of available influenza diagnostic tests

Sensor type	Biological capture probe	Influenza virus subtype	Detection method	LOD	Detection time	Reference
Lateral flow assay	Nucleic acid aptamers and antibody	H3N2	Naked eye observation & color intensity	$2 \times 10^6$ virus particles	15 min	[21]
	Antibody	H1N1	Naked eye observation & color intensity	350 TCID <sub>50</sub> /mL	15 min	[22]
ELISA	Antibody	H5N1	Naked eye observation & absorbance	0.04 ng/mL	< 7 h	[23]
Gold nanoshell based assay	Aptamer	H5N1	Naked eye observation	$3 \times 10^8$ virus particles	-	[24]
Gold-carbon nanotube hybrid assay	Antibody	H3N2	Naked eye observation & absorbance	3.4 PFU/mL	< 4 h	[25]
Polydiacetylene (PDA) liposome	Sialic Acid	Influenza virus	Naked eye observation & color intensity	11 HAU (11 $\times 10^7$ virus particles)	30 min	[26]
	M1 antibody	H1N2	Fluorescence	$2^2$ HAU ( $29 \times 10^5$ TCID <sub>50</sub> )	1 h	[27]
	Peptide	pH1N1	Naked eye observation & color intensity	$10^5$ PFU ( $0.2 \times 10^3$ TCID <sub>50</sub> )	5 min	[28]
PDA-paper chip	Antibody	Influenza A virus (pH1N1)	Naked eye observation & color intensity	$10^3 \sim 5 \times 10^3$ TCID <sub>50</sub>	3 h	-

**Table S2.** Characteristics of biosensors for influenza A virus detection.