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Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see Authors & Referees and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed	
☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☐	☒	A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒	The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☐	☒	A description of all covariates tested
☐	☒	A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☐	☒	A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☐	☒	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☒	☐	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	ProCam4
Data analysis	ImageJ with custom macro; custom MATLAB codes (both deposited in GitHub).

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

The animated GIF demonstrating the assembly of the microscope enclosure is available in the Supplementary Movie S1. The video clip demonstrating the assay procedure is available in the Supplementary Movie S2. All data are included as figures in this manuscript. Representative raw images of assaying norovirus capsids are publicly available through GitHub: through GitHub: https://github.com/jeongyeolyoon/yoon-lab/Raw photo examples.zip. All other raw smartphone images are available are available upon reasonable request from the corresponding author.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Detection of norovirus from DI water, tap water, and reclaimed wastewater
Research sample	Norovirus capsids dissolved in DI water; Intact norovirus collected from contaminated groundwater, spiked into DI water, tap water, and reclaimed wastewater.
Sampling strategy	All samples were deliberately spiked with norovirus capsids or intact norovirus.
Data collection	All data were collected using the paper microfluidic chip and smartphone based fluorescence microscope described in this protocol.
Timing and spatial scale	Spiked samples were assayed within 4 hours from their preparations. All data described in this protocol have been collected over 1.5 years.
Data exclusions	When the smartphone images were not focused or with low light exposure, the code could not isolate any immunoagglutinated particles, and such data were subsequently not collected.
Reproducibility	All collected pixel areas were included in this protocol, with standard error bars, with the exception mentioned above.
Randomization	Assays were conducted in a completely random order, i.e. not in ascending or descending order of norovirus concentration.
Blinding	At least two persons were present during all of the assays, where the sample preparation and the assay were not performed by the same person.

Did the study involve field work? ☐ Yes ☒ No

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☐	☒ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used	Rabbit polyclonal antibody to norovirus capsid protein VP1 (anti-norovirus; catalog number ab92976; Abcam, Inc.; Cambridge, MA, USA)
Validation	Anti-norovirus conjugated particles were mixed with norovirus capsids, and imaged under a benchtop microscope for their immunoagglutination behavior.