nature portfolio

Corresponding author(s): Sibao Wang

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Reporting Summary

Nature Portfolio 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 Portfolio policies, see our Editorial Policies 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	N/A
Data analysis	The statistical significance of differences in virus / actin mRNA ratio between two treatments was analyzed using t a nonparametric Mann-Whitney test. Other statistical significance was calculated using a two tailed Student's t-test for unpaired comparisons between two groups, or one-way analysis of variance (or one-way ANOVA) between more than two groups. A value of $P < 0.05$ was considered to be statistically significant. Statistical analyses were performed using GraphPad Prism version 5.00 for Windows (GraphPad Software).

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 and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio 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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

All data needed to understand and access the conclusions of this research are available in the main text and supplementary materials.

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	N/A
Reporting on race, ethnicity, or other socially relevant groupings	N/A
Population characteristics	N/A
Recruitment	N/A
Ethics oversight	N/A

Note that full information on the approval of the study protocol must also be provided in the manuscript.

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

Life sciences study design

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

Sample size	To evaluate the effect of engineered mosquitoes on virus infections, 13-32 mosquitoes were used in each group. To evaluate the caspase activity by luciferase reportor assay in mosquito midgut in vivo, 10-15 mosquitoes were used in each group. To evaluate the expression of indicated genes between different treatments, 20-25 mosquito midguts were used in each group.
Data exclusions	No data were excluded.
Replication	All replications showed similar results.
Randomization	The same batch of adult mosquitoes were separated in to different groups randomly in each test.
Blinding	Blinding was not relevant to this study.

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 and archaeology
☐	☒ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

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

Antibodies

Antibodies used	We used commercially available Dengue Virus NS1 antibody (Gene Tex, Cat#GTX124280; Abcam, ab41623), Dengue Virus E antibody (GeneTex GTX127277), Dengue Virus (Santa Cruz Biotechnology, Cat#sc-65659), Actin-Tracker Red-594 (Beyotime Biotech, Cat#C2205S), Alexa Fluor 488 (Beyotime Biotech, Cat#A0428), Flag antibody (Genscript, Cat#A00170), V5 antibody (Genscript, Cat# A01724), Goat anti-Mouse IgG (H+L) (Invitrogen, Cat#31430), Goat Anti-Rabbit IgG H&L (Abcam, Cat#ab150077), Alexa Fluor 555 (Invitrogen, Cat#A21422) and HRP-conjugated secondary antibody (Proteintech, Cat. No # SA00001-2) in western blot analysis and immunohistochemistry.
Validation	Dengue virus NS1 protein antibody: Rabbit; Polyclonal; Isotype; IgG; Applications:WB, ICC/IF, IHC-P, FCM, IP, ELISA, IHC-P (cell pellet). Anti-Dengue Virus NS1 glycoprotein antibody [DN2]: Mouse Monoclonal POLG antibody. Suitable for Flow Cyt, WB, ICC/IF and reacts with Dengue virus 2 samples. Dengue virus Envelope protein: this antibody was raised against Dengue virus 2 Envelope protein, which may cross react with Envelope protein of Dengue virus 3 but does not recognize with Envelope protein of JEV. Dengue Virus (D1-11) is a mouse monoclonal antibody raised against Dengue Virus serotypes 1, 2, 3 and 4.Dengue Virus (D1-11) is recommended for detection of Dengue Virus 1, 2, 3 and 4 of Dengue Virus 1, 2, 3, and 4 origin by Western Blotting (starting dilution 1:200, dilution range 1:100-1:1000), immunofluorescence (starting dilution 1:50, dilution range 1:50-1:500) and immunohistochemistry (including paraffin-embedded sections) (starting dilution 1:50, dilution range 1:50-1:500). Actin-Tracker Red-594 is a red fluorescent probe for actin, which can be used for specific fluorescent staining of actin in cultured cells or tissue sections. The Actin-Tracker Red-594 probe is composed of the fluorescent dye Alexa Fluor 594 conjugated to phalloidin (also known as phallotoxin or amanitin), referred to as phalloidin-Alexa Fluor 594. Its maximum excitation wavelength is 581 nm, and its maximum emission wavelength is 609 nm. The fluorescence spectrum of Actin-Tracker Red-594 is similar to that of Texas Red, and it can be detected using the same detection settings as Texas Red. The recommended dilution ratio for this AF488-labeled goat anti-mouse IgG (H+L) in immunofluorescence staining is 1:500. During actual experimentation, the dilution ratio of the fluorescently labeled secondary antibody should be adjusted appropriately based on the specific antigen and primary antibody used. The recommended adjustment range is 1:200 to 1:1000. Flag antibody Genscript Cat#A00170, Rabbit IgG, Polyclonal, ELISA 0.01-0.05 µg/ml, Western Blot 0.1-1.0 µg/ml, Western Blot 1:100-1:1,000, Immunocytochemistry/Immunofluorescence (ICC/IF) 5-20 µg/ml, Flow Cytometry 1-3 µg for 1 x 106 cells. V5 antibody Genscript Cat# A01724, Mouse, IgG2a,Monoclonal, ELISA,Western Blot, Immunoprecipitation (IP), Flow Cytometry, Immunocytochemistry/Immunofluorescence (ICC/IF) Goat anti-Mouse IgG (H+L) Invitrogen Cat#31430, Mouse, IgG, Product # 31430 has been successfully used in Western blot, IHC, ELISA and IP applications. Goat Anti-Rabbit IgG H&L Abcam Cat#ab150077, Rabbit IgG, ICC/IF, Flow Cyt, IHC-P, ELISA, IHC-Fr. Goat anti-Mouse IgG (H+L) Cross-Adsorbed Secondary Antibody, Alexa Fluor™ 555, Invitrogen Cat#A21422, Mouse, Polyclonal, 553/568 nm.

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	Aedes albopictus clone C6/36 cell line, Aedes aegypti clone Aag2 cell line and HEK293T cell line was purchased from ATCC.
Authentication	N/A
Mycoplasma contamination	Cell lines were not contaminated by mycoplasma.
Commonly misidentified lines (See ICLAC register)	These cell lines are unique in cell morphology and biological properties, and they are used in young generations, unlikely to be misidentified.

Animals and other research organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research, and Sex and Gender in Research

Laboratory animals	Aedes aegypti
Wild animals	N/A
Reporting on sex	female
Field-collected samples	N/A
Ethics oversight	This study was conducted in accordance with the guidelines of the CAS Center for Excellence in Molecular Plant Sciences (Shanghai Institute of Plant Physiology and Ecology) Animal Care and Use Committee (A01MP2001)

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Plants

Seed stocks	N/A
Novel plant genotypes	N/A
Authentication	N/A