nature portfolio

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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	MestRec 4996, Living Image(64-bit), Accuri C6 Plus Software v1.0.23.1, LAS X, NIS-Elements AR 4.51.00
Data analysis	FlowJo.v10.9.0, Graphpad Prism 10, LAS X, OriginPro 9.1 64Bit, Excel, Image J

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

The authors declare that the data supporting the findings of this study are available in the article and its Supplementary Information and Source data files. All devices and reagents were commercially available and are described in the Methods section.

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	In vitro experiments were repeated at least three times. For in vivo experiments, at least 3 mice per group were used, and details regarding the sample size of all experiments are provided in figure legends.
Data exclusions	No data were excluded from studies.
Replication	Each experiment was repeated at least three times with similar results. Data are presented as mean and standard deviation or standard error of mean.
Randomization	The samples were randomly divided into experimental groups.
Blinding	In all experiments, investigators were blinded to group allocation during data collection and analysis.

Behavioural & social sciences study design

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

Study description	
Research sample	
Sampling strategy	
Data collection	
Timing	
Data exclusions	
Non-participation	
Randomization	

Ecological, evolutionary & environmental sciences study design

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

Study description	
Research sample	
Sampling strategy	
Data collection	
Timing and spatial scale	
Data exclusions	
Reproducibility	
Randomization	
Blinding	

Did the study involve field work? ☐ Yes ☐ No

Field work, collection and transport

Field conditions	
Location	
Access & import/export	
Disturbance	

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	The following antibodies were used for flow cytometry. They are listed as antigen first, followed by supplier, catalog number and clone/lot number as applicable. PE-anti-mouse-CD11c antibody, Biolegend, cat.no. 117308, Clone: N418, 1:400 dilution. PE-anti-mouse-CD3 antibody, Biolegend, cat. no. 100205, Clone: 17A2, 1:400 dilution. APC-anti-mouse-CD8a antibody, Biolegend, cat. no. 100712, Clone: 53-6.7, 1:400 dilution. APC-anti-mouse-CD86 antibody, Biolegend, cat. no. 105012,Clone: GL-1, 1:400 dilution. PerCP/Cyanine5.5 anti-mouse-CD4 antibody, Biolegend, cat. no. 100434, Clone: GK1.5, 1:400 dilution. PerCP/Cyanine5.5 anti-mouse-CD80 antibody, Biolegend, cat. no. 104722, Clone: 16-10A1, 1:400 dilution.

FITC-anti-mouse-CD206 antibody, Biolegend, cat. no. 141704,Clone: C068C2, 1:400 dilution.
PE-anti-mouse-F4/80 antibody, Biolegend, cat. no. 111704, Clone: W20065D, 1:400 dilution.
FITC-anti-mouse-CD279(PD-1) antibody, Biolegend, cat. no. 135214, Clone: 29F.1A12, 1:400 dilution.
FITC-anti-mouse-CD47 antibody, Biolegend,cat. no. 127504, Clone: miap301, 1:400 dilution.
Alexa Fluor-anti-mouse-CD45 antibody, Biolegend, cat. no. 103127, Clone: 30-F11, 1:400 dilution.
FITC-anti-mouse-CD25 antibody, Proteintech, cat.no. FITC-65137, Clone: PC61.5, 1:400 dilution.
APC-anti-mouse-Foxp3 antibody, Proteintech, cat. no. APC-65089, Clone: 3G3, 1:400 dilution.
APC-anti-mouse-CD11b antibody, Cell Signaling Technology, cat. no. 41249S, 1:400 dilution.
Alexa Fluor 488-anti-mouse-Calreticulin antibody, Abcam, cat. no. ab196158, 1:400 dilution.
FITC-Anti-CD8(Mouse)mAb antibody, MBL, K0227-4, Clone: KT15.
PE-Tetramer-SIINFEKL antibody, MBL, TS-5001-1C.

The following antibodies were used for immunofluorescence. They are listed as antigen first, followed by supplier, catalog number and clone/ lot number as applicable.
Alexa Fluor 488-anti-mouse-Calreticulin antibody, Abcam, cat. no. ab196158, 1:200 dilution.
Alexa Fluor 488-anti-mouse-HMGB1 antibody, Biolegend, cat. no. 651410.Clone: 3E8, 1:200 dilution.

The following antibodies were used forimmunohistochemistry. They are listed as antigen first, followed by supplier, catalog number and clone/ lot number as applicable.
Rabbit Anti-CD8 antibody, Bioss, cat. no. bs-0648R, 1:500 dilution.
Rabbit Anti-CD4 antibody, bioss, cat. no. bs-52469R, 1:500 dilution.
CD3 antibody, Santa Cruz Biotechnology, cat. no. sc-18843, 1:500 dilution.
HMGB1 antibody, Abmart, cat. no. T55060F, 1:500 dilution.
Rabbit Anti-Foxp3 antibody, Bioss, cat. no. bs-10211R, 1:500 dilution.

The following antibodies were used for western blot. They are listed as antigen first, followed by supplier, catalog number and clone/ lot number as applicable.
Anti-DDIT3 antibody, abcam, cat.no. ab11419, 1:1000 dilution.
Anti-MLKL antibody, abcam, cat.no.ab183770, 1:1000 dilution.
Anti-p-PERK antibody, Cell Signaling Technology, cat.#3179S, 1:1000 dilution.
Anti-p-elf2α antibody, Cell Signaling Technology, cat.#9721S, 1:1000 dilution.
Anti-ATF4 antibody, Santa Cruz Biotech, cat.no.sc-390063, 1:1000 dilution.
Anti-cleaved caspase-1 antibody, Affinity, cat.no. Ala317, 1:1000 dilution.
anti-N-GSDMD antibody, Biolegend, cat.no. 939701, 1:1000 dilution.

The following antibodies were used for in vivo. They are listed as antigen first, followed by supplier, catalog number and clone/lot number as applicable.
Purified anti-mouse-CD47 antibody, Biolegend, cat. no.127501. Clone: miap301.
Purified anti-mouse-CD279(PD-1) antibody, Biolegend, cat. no.114101. Clone: RMP1-14.

Validation

The species and application of the following antibodies used for flow cytometry were validated by the manufacturer.
PE-anti-mouse-CD11c antibody, Biolegend, https://www.biolegend.com/en-us/products/pe-anti-mouse-cd11c-antibody-1816
PE-anti-mouse-CD3 antibody, Biolegend, https://www.biolegend.com/en-us/products/pe-anti-mouse-cd3-antibody-47
APC-anti-mouse-CD8a antibody, Biolegend, https://www.biolegend.com/en-us/products/apc-anti-mouse-cd8a-antibody-150
APC-anti-mouse-CD86 antibody, Biolegend, https://www.biolegend.com/en-us/search-results?Keywords=APC+anti-mouse+CD86
PerCP/Cyanine5.5 anti-mouse-CD4 antibody, Biolegend, https://www.biolegend.com/en-us/products/percp-cyanine5-5-anti-mouse-cd4-antibody-4220
PerCP/Cyanine5.5 anti-mouse-CD80 antibody, Biolegend, https://www.biolegend.com/en-us/products/percp-cyanine5-5-anti-mouse-cd80-antibody-4275
FITC-anti-mouse-CD206 antibody, Biolegend, https://www.biolegend.com/en-us/products/fitc-anti-mouse-cd206-mmr-antibody-7318
PE-anti-mouse-F4/80 antibody, Biolegend, https://www.biolegend.com/en-us/products/pe-anti-mouse-f4-80-antibody-22815
FITC-anti-mouse-CD279(PD-1) antibody, Biolegend, https://www.biolegend.com/en-us/products/fitc-anti-mouse-cd279-pd-1-antibody-7004
FITC-anti-mouse-CD47 antibody, Biolegend, https://www.biolegend.com/en-us/products/fitc-anti-mouse-cd47-antibody-4753
Alexa Fluor-anti-mouse-CD45 antibody, Biolegend, https://www.biolegend.com/en-us/products/alexa-fluor-700-anti-mouse-cd45-antibody-3407
FITC-anti-mouse-CD25 antibody, Proteintech, https://www.ptgcn.com/products/CD25-Antibody-FITC-65137.htm
APC-anti-mouse-Foxp3 antibody, Proteintech, https://www.ptgcn.com/products/Foxp3-Antibody-APC-65089.htm
APC-anti-mouse-CD11b antibody, Cell Signaling Technology, https://www.cellsignal.cn/products/antibody-conjugates/cd11b-itgam-m1-70-rat-mab-apc-conjugate/41249
Alexa Fluor 488-anti-mouse-Calreticulin antibody, Abcam, https://www.abcam.cn/products/primary-antibodies/alexa-fluor-488-calreticulin-antibody-epr3924-er-marker-ab196158.html

The species and application of the following antibodies used for immunofluorescence staining were validated by the manufacturer.
Alexa Fluor 488-anti-mouse-Calreticulin antibody, Abcam, https://www.abcam.cn/products/primary-antibodies/alexa-fluor-488-calreticulin-antibody-epr3924-er-marker-ab196158.html
Alexa Fluor 488-anti-mouse-HMGB1 antibody, Biolegend, https://www.biolegend.com/en-us/products/alexa-fluor-488-anti-hmgb1-antibody-12706

The species and application of the following antibodies used for immunohistochemistry assay were validated by the manufacturer.
Rabbit Anti-CD8 antibody, Bioss, http://www.bioss.com.cn/prolook_03.asp?id=AF08169606001059&pro37=1

Rabbit Anti-CD4 antibody, bioss, http://www.bioss.com.cn/prolook_03.asp?id=AI10230950273742&pro37=1
CD3 antibody, Santa Cruz Biotechnology, https://www.scbt.com/zh/p/cd3-antibody-17a2?requestFrom=search
HMGB1 antibody, Abmart, http://www.ab-mart.com.cn/page.aspx?node=%2077%20&id=%201363
Rabbit Anti-Foxp3 antibody, Bioss, http://www.bioss.com.cn/prolook_03.asp?id=AF08169606017707&pro37=1

The species and application of the following antibodies used for western blot was validated by the manufacturer.
Anti-DDIT3 antibody, abcam, https://www.abcam.cn/products/primary-antibodies/ddit3-antibody-9c8-ab11419.html

The species and application of the following antibodies used for in vivo were validated by the manufacturer.
Purified anti-mouse-CD47 antibody, Biolegend, https://www.biolegend.com/en-us/products/purified-anti-mouse-cd47-antibody-4752

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	B16F10, RAW264.7, DC, LLC, Pan02, U87-MG, 4T1, MC38 cells were obtained from American Type Culture Collection (ATCC).
Authentication	These cell lines were authenticated by Wuhan Pricella Biotechnology (Wuhan, China) using STR analysis. Specifically, 20 STR loci were amplified using Microreader 21 ID System.The PCR products were detected by GenReader 7010, and the results were analyzed by GeneMapper Software6 and compared with ExPASy database.
Mycoplasma contamination	All cell lines were tested negative by using Myco-Lumi Luminescent Mycoplasma Detection Kit for mycoplasma contamination.
Commonly misidentified lines (See ICLAC register)	No misidentified cell lines used in the study.

Palaeontology and Archaeology

Specimen provenance	
Specimen deposition	
Dating methods	

☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.

Ethics oversight	

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

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	C57BL/6J mice (Six-eight-week-old, female) were purchased from SPF (Beijing) Biotechnology Co, and maintained at the animal facility of ZhengZhou University in a pathogen-free facility in a standard environmentally controlled room with 30% to 70% humidity and 22°C temperature under a 12 h light-dark cycle. Standard water and diet were offered for the mice.
Wild animals	N/A
Reporting on sex	Famale
Field-collected samples	No field collected samples were used in the study.
Ethics oversight	This research complies with all relevant ethical regulations. All animal experiments were executed according to the Institute of Drug Discovery & Development of Zhengzhou University (syxk (yu) 2018-0004) approved protocol.

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

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration	
Study protocol	
Data collection	
Outcomes	

Dual use research of concern

Policy information about dual use research of concern

Hazards

Could the accidental, deliberate or reckless misuse of agents or technologies generated in the work, or the application of information presented in the manuscript, pose a threat to:

No	Yes	
☐	☐	Public health
☐	☐	National security
☐	☐	Crops and/or livestock
☐	☐	Ecosystems
☐	☐	Any other significant area

Experiments of concern

Does the work involve any of these experiments of concern:

No	Yes	
☐	☐	Demonstrate how to render a vaccine ineffective
☐	☐	Confer resistance to therapeutically useful antibiotics or antiviral agents
☐	☐	Enhance the virulence of a pathogen or render a nonpathogen virulent
☐	☐	Increase transmissibility of a pathogen
☐	☐	Alter the host range of a pathogen
☐	☐	Enable evasion of diagnostic/detection modalities
☐	☐	Enable the weaponization of a biological agent or toxin
☐	☐	Any other potentially harmful combination of experiments and agents

Plants

Seed stocks	
Novel plant genotypes	
Authentication	

ChIP-seq

Data deposition

☐ Confirm that both raw and final processed data have been deposited in a public database such as GEO.

☐ Confirm that you have deposited or provided access to graph files (e.g. BED files) for the called peaks.

Data access links *May remain private before publication.*	
Files in database submission	
Genome browser session (e.g. UCSC)	

Methodology

Replicates	
Sequencing depth	
Antibodies	
Peak calling parameters	
Data quality	
Software	

Flow Cytometry

Plots

Confirm that:

☒ The axis labels state the marker and fluorochrome used (e.g. CD4-FITC).

☒ The axis scales are clearly visible. Include numbers along axes only for bottom left plot of group (a 'group' is an analysis of identical markers).

☒ All plots are contour plots with outliers or pseudocolor plots.

☒ A numerical value for number of cells or percentage (with statistics) is provided.

Methodology

Sample preparation	For cell samples, the specific experimental methods and procedures are given in the article For tissue sample, the tissue was first mechanically disrupted from mice and divided into small pieces and homogenized in cold staining buffer to form single cell suspensions in the presence of digestive enzyme.
Instrument	Flow cytometer (BD Accuri C6 Plus, USA)
Software	Data was analyzed by FlowJo 10.9.0
Cell population abundance	No sorting was performed.
Gating strategy	Generally, cells were first gated on FSC/SSC. Singlet cells were usually gated using FSC-H and FSC-A. Surface antigen gating was performed on the live cell population.

☒ Tick this box to confirm that a figure exemplifying the gating strategy is provided in the Supplementary Information.

Magnetic resonance imaging

Experimental design

Design type	
Design specifications	
Behavioral performance measures	

Acquisition

Imaging type(s)

Field strength

Sequence & imaging parameters

Area of acquisition

Diffusion MRI ☐ Used ☐ Not used

Preprocessing

Preprocessing software

Normalization

Normalization template

Noise and artifact removal

Volume censoring

Statistical modeling & inference

Model type and settings

Effect(s) tested

Specify type of analysis: ☐ Whole brain ☐ ROI-based ☐ Both

Statistic type for inference

(See Eklund et al. 2016)

Correction

Models & analysis

n/a	Involved in the study
☐	☐ Functional and/or effective connectivity
☐	☐ Graph analysis
☐	☐ Multivariate modeling or predictive analysis

Functional and/or effective connectivity

Graph analysis

Multivariate modeling and predictive analysis