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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	Origin 8, ZEN 2010, ImageJ 1.49, FlowJo 7.6.1
Data analysis	General statistical data was analyzed using GraphPad Prism software Version 7 or SPSS software Version 17.0.

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 data that support the findings of this study are available within the paper and its Supplementary Information files, or are available from the corresponding authors upon reasonable request.

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

Life sciences study design

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

Sample size	We calculated the sample size by power analysis and determined that we required at least 3 replicates to derive an appropriate statistical test.
Data exclusions	No data were excluded from the analyses.
Replication	We confirmed that the attempts at replication were successful.
Randomization	All samples/organisms were randomly allocated into experimental groups.
Blinding	All the investigators were blinded to group allocation during data collection and analysis.

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
[ ]	[x] Antibodies
[ ]	[x] Eukaryotic cell lines
[x]	[ ] Palaeontology
[ ]	[x] Animals and other organisms
[x]	[ ] Human research participants
[x]	[ ] Clinical data

Methods

n/a	Involved in the study
[x]	[ ] ChIP-seq
[ ]	[x] Flow cytometry
[x]	[ ] MRI-based neuroimaging

Antibodies

Antibodies used	Interleukin 6 ELISA kit (Abcam, ab222503), interleukin 1-beta ELISA kit (Abcam, ab197742), tumor necrosis factor alpha ELISA kit (Abcam, ab208348), heme oxygenase-1 ELISA kit (Abcam, ab204524), and kidney injury molecule-1 ELISA kit (Abcam, ab213477) were used in this study. 96-well plates pre-coated with these antibodies were provided by the vendor. NF-κB p65 (L8F6), phospho-NF-κB p65 (Ser536, E1Z1T), IκB-α (L35A5), phospho-IκB-α (Ser32/36, 5A5) (Cell Signaling Technology, USA) and β-Actin (Sungene Biotech, China) .
Validation	All antibodies were verified by the supplier and each lot has been quality tested.

Eukaryotic cell lines

Policy information about cell lines

Cell line source(s)	HEK293 cell line was purchased from ATCC (Manassas, Virginia, USA).
Authentication	A short tandem repeat DNA profiling method was used to authenticate the cell lines and the results were compared with reference database.
Mycoplasma contamination	No mycoplasma contamination was found.
Commonly misidentified lines (See ICLAC register)	No commonly misidentified cell lines were used in this study.

Animals and other organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research

Laboratory animals	BALB/c and C57BL/6 mice (female, 8–10 weeks) were purchased from the Experimental Animal Department of the Third Military Medical University (Chongqing, China).
Wild animals	No wild animals were used in this study.

Field-collected samples	This study did not involve samples collected from the field.
Ethics oversight	All animal experiments were performed according to protocols approved by the Department of Laboratory Animal Science at Third Military Medical University and complied with all relevant ethical regulations.

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

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 apoptosis detection, HEK293 cells in a well were collected, washed with cold PBS and re-suspended in 195 μL binding buffer after different treatment. Then, 5 μL Annexin V-FITC and 10 μL PI were sequentially added to the cell suspension and incubated at room temperature in dark for 15 min before flow cytometric analysis. For intracellular ROS level detection, after incubation with H2O2 for 24 h, cells were gently rinsed thrice with serum-free medium to remove the free Cu5.4O USNPs. Then, a final concentration of 10 μM of DCFH-DA in serum-free medium was added to the cells and incubated in dark at 37 °C for 30 min. Afterwards, the cells were washed with serum-free medium thrice to remove unloaded DCFH-DA probe before flow cytometric analysis.
Instrument	Attune Acoustic Focusing Cytometer (Life Technologies, USA)
Software	Attune Cytometric software v2.1 was used to collect flow cytometry data and FlowJo 7.6.1 was used to analyse flow cytometry data.
Cell population abundance	By stained with specific fluorescence-labeled antibodys, cells were separated into different parts and FlowJo can calculate the fractions.
Gating strategy	For cell apoptosis detection, Annexin V-FITC was used to label apoptotic and necrotic cells, and PI was used to label necrotic cells. PBS-treated cells were stained with/without Annexin-V-FITC or PI to determine gate. For intracellular ROS level detection, PBS-treated cells were stained without DCFH-DA to determine gate.

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