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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	GloMax Discover Microplate Reader was used for cell/organoid viability analysis. BD FACS Canto II Clinical Flow Cytometry System was used for lipid peroxidation analysis. CFX96 TouchTM Real-Time PCR Detection System (Bio-Rad) was used for qPCR analysis. ChemiDoc MP Imaging System (Bio-Rad) was used for western blots analysis. Carl Zeiss Confocal LSM980 was used for immunofluorescence staining. VS200 Research Slide Scanner (Olympus) was used for IHC images.
Data analysis	FACS data was analyzed by FlowJo. Western blots image was analyzed by Image Lab Software. Immunofluorescence images were analyzed with QuPath. H&E and IHC images were analyzed with Fiji. GraphPad were used for bar graphs output and statistical analysis.

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

Data availability statement is included in the manuscript. Other information was included in Methods or in Supplementary Information.

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	Sex, assigned at birth, was recorded for all the patients in our cohort, including 91 males (55.5%) and 73 females (44.5%), reflecting the natural prevalence of gastric cancer (GC). Gender was not considered in our study.
Reporting on race, ethnicity, or other socially relevant groupings	Race, ethnicity or other socially relevant variables were not considered in our study.
Population characteristics	A cohort of 164 human GC specimens were collected from the Union Hospital, Tongji Medical College, Huazhong University of Science and Technology. Detailed information of these patients was provided in Supplementary Table 1.
Recruitment	The human biological tissues were obtained from patients ethically who underwent preoperative biopsy and preoperative neoadjuvant chemotherapy at Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, and their research use was in accord with the terms of the informed consent provided.
Ethics oversight	The study design and usage of samples were approved by Ethics Committee of Union Hospital, Tongji Medical College, Huazhong University of Science and Technology.

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	Sample size, number of replicates, error bars and statistical test were chosen based experiments and stated in each figure legends. All the experiments including technical replicates were repeated at lest three independent times. No statistical methods were used to pre-determine sample sizes.
Data exclusions	No data was excluded from this study.
Replication	Stated in Methods and/or the respective figure legends.
Randomization	For in vivo mouse models, mice were randomly allocated into each experimental group. In vitro experiments were not randomized; all cell samples were analyzed equally without sub-sampling, so in in vitro experiments were no need for randomization.
Blinding	Investigators were blinded to patient prognosis during IHC analysis of specimens. For the other experiments, the investigators were not blinded to experimental groups 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
☐	☒ 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	All the antibodies used in this study were included in Supplementary Table 2.
Validation	Based on manufacturer's Certificate of Analysis.

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	ATCC.
Authentication	Information on cell line authentication by STR was provided by the commercial sources for each cell line.
Mycoplasma contamination	The cell lines were tested negative for mycoplasma contamination.
Commonly misidentified lines (See ICLAC register)	No commonly misidentified cell lines were used in the study.

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	BALB/c nude mice with 6-8 week age were used in this study.
Wild animals	The study did not involved wild animals.
Reporting on sex	To avoid additional variables from mixed sex populations, all male mice were used in this study.
Field-collected samples	Not used.
Ethics oversight	The Institutional Animal Care and Use Committee of Mayo Clinic.

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

Plants

Seed stocks	Not applicable
Novel plant genotypes	Not applicable
Authentication	Not applicable

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	The indicated cells were seeded in 6-well plates with the indicated treatment. Before trypsinization, the cells were incubated with C11-BODIPY (581/591) for 30 min.
Instrument	The analysis was performed using a flow cytometery (FACS Canto II, BD Biosciences) with a 488-nm laser for excitation.
Software	The data were analyzed using FlowJo software.
Cell population abundance	At least 10,000 cells were analyzed for each sample.
Gating strategy	Data were collected from the FL1 detector (C11-BODIPY) using a 502LP and 530/30 BP filter.

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