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	Standard software and the respective analysis tools provided by manufacturers were listed in the methods (Zeiss microsystems, QuantStudio 3, etc.). No software was used other than that listed in the Methods.
Data analysis	Student's t-test analysis was done by using Excel and Prism GraphPad 6.0. All microscopy data was collected and analyzed using the Zeiss microsystems and ZEN software. Immunofluorescence and Western blots images analysis was performed by 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

All data supporting the findings of this study are available from the corresponding authors upon request.

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	These findings applied to either sex. So we used human primary islets randomly from males and females. The specific informations of donors for providing islets were provided in manuscript Table S6.
Reporting on race, ethnicity, or other socially relevant groupings	The donors for providing islets were all Chinese.
Population characteristics	The specific informations of donors for providing islets were provided in manuscript Table S6.
Recruitment	The human islets were all from organ donors with or without Type 2 diabetes disease and with research consents.
Ethics oversight	All protocols were approved by the Medical Ethical Committee of Tianjin First Central Hospital (No.2016N086KY).

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	At least three biological replicates were achieved for all experiments. Such sample sizes are typical for the in vitro experiments. For in vivo experiments, a sample size of n ≥5 mice was used per experimental group.
Data exclusions	No data was excluded in this study.
Replication	All western blot, qRT-PCR, immunofluorescence experiments were repeated with at least three biological and/or technical replicates to ensure reproducibility. The detail was indicated in the Methods section.
Randomization	For animal studies, Galectin-3 Knockout mice and control mice were randomly distributed into group and then earmarked by an independent researcher. db/db mice were grouped according to bodyweight, fasting blood glucose and insulin sensitivity.
Blinding	All experiments were performed in a non-blinded manner.

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	Western Blots: anti-flag Tag (MBL, #M185, 1:10000), anti-GFP Tag (MBL, #598, 1:5000), anti-Phospho S473 Akt (Cell Signaling

Antibodies used	Technology, CST, #4060, 1:2000), anti-Akt (CST, #4691, 1:1000), anti-beta Actin (Proteintech, #66009-l-lg, 1:5000). Immunofluorescence: anti-galectin3 (Abcam, #ab2785, 1:100), anti-cacng1 (Novus, #NBP2-76917, 1:200), anti-insulin (R&D Systems, #MAB1417, 1:200; Abcam, #ab7842, 1:100), anti-CD11c (CST, #97585, 1:100), anti-glucagon (CST, #2760, 1:200), anti-F4/80 (1:100, Abcam, ab6640).
Validation	Validation statements for all used antibodies are available at the websites of the commercial providers.

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	MIN6 were obtained from Dr. Tao Xu, a professor from the Institute of Biophysics, Chinese Academy of Sciences. INS1 were obtained from ACCEGEN. HEK293T were obtained from the Chinese National Infrastructure of Cell Line Resource. The mice primary islets were obtained from males. The human primary islets were obtained from males and females.
Authentication	INS1 and HEK293T were authenticated by ACCEGEN or the Chinese National Infrastructure of Cell Line Resource. MIN6 were authenticated by the cell morphology and function. Primary islets were authenticated by staining with dithizone (DTZ).
Mycoplasma contamination	Cell lines were routinely tested for potential mycoplasma contamination by using commercial mycoplasma detection kits (Londa, LT07-418). All test were negative.
Commonly misidentified lines (See ICLAC register)	There were no commonly misidentified lines in our 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	6-8 weeks old C57BL/6J mice (Vital River Lab Animal Technology, Beijing, China), 6-8 weeks db/db mice (Model Animal Research Center of Nanjing University), Gal3 knockout mice (Provided by Dr. Jerrold M. Olefsky from UC San Diego.). Male mice were hosted for all experiments. Ins1 cre-GCaMP6f mice (Provided by Dr. Liangyi Chen's lab at Peking University), Cacng1 global KO mice and Cacng1fl/fl mice (Gempharmatech Co., Ltd.), Lyz2-icre mice (Gempharmatech Co., Ltd.), ZK-003CKO (Gal3f/f) mice (BIOCYTOGEN).
Wild animals	does not apply
Reporting on sex	These findings applied to either sex. We used mice primary islets from males or females, and the results from males or females are comparable.
Field-collected samples	does not apply
Ethics oversight	All experiments using animals were performed in accordance with protocols approved by the Animal Experimentation Ethics Committee of the Chinese Academy of Medical Sciences, and all procedures were conducted in accordance with the guidelines of the Institutional Animal Care and Use Committees of the Chinese Academy of Medical Sciences. All animal procedures were consistent with the ARRIVE guidelines.

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

Plants

Seed stocks	does not use plants
Novel plant genotypes	does not use plants
Authentication	does not use plants