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<br>*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<br>*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 | Titan Krios G4 (FEI/Thermo Fisher Scientific), BioQuantum K3 detector (Gatan) |
| Data analysis | cryoSPARC v4.2.1, Phenix 1.20.1-4487, Coot v0.8, PyMOL v2.4.0 , UCSF ChimeraX 1.3, CTFFIND4, Topaz (version 0.2.4), isolde 1.3, Octet BLI Analysis software package v12.2.2.4 (Sartorius), Harmony 4.9 software, RStudio 4.3, ImageJ 1.54g, QuickFigures, GraphPad Prism (version 9.5.0) |

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 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

Cryo-EM density map and coordinate have been deposited in the Protein Data Bank: 9IMZ for coordinate and EMD-60697 for density map of CODANIN-1 and ASF1A complex. Source data are provided with this paper.

## 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 | For the cryo-EM, a single purified protein complex sample was used. The data size of Cryo-EM depends on optical settings and particle concentration on micrographs. The optical settings, total number of micrographs, and extracted particles are provided in the Methods and Table. In vitro biochemical studies were performed with three biological replicates. Western blot was performed independently two times, and microscopy was conducted with four biological replicates. |
| Data exclusions | No data were excluded. |
| Replication | For the structural studies, no replication was performed. All pulldown assays were conducted with three biological replicates. Biolayer interferometry (BLI) assay was conducted once for all variants. All western blots were performed with 2 biological replicates. Cell-based experiments were performed with 4 biological replicates. |
| Randomization | For the cryo-EM analysis, particles were split into two halves to determine the half maps and final resolution. For the pulldown and BLI assays, samples were randomly allocated into experimental groups. |
| Blinding | Investigators were not blinded to the allocation during experiments or data analysis. All results were analyzed quantitatively, and none of the methods employed necessitated blinding. |

# 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 | 1. Anti-CODANIN-1 (Abcam Cat#: Ab204392, Lot no. GR3370226-5)<br>2. Anti-HA (BioLegend Cat# 901513, Clone 16B12)<br>3. Anti-Tubulin (Abcam Cat#: Ab6160, Lot. no. 1011061-1)<br>4. Anti-ASF1A (Cell Signalling Cat#: 2990S, Clone C6E10)<br>5. Anti-Rabbit Alexa 488 (Invitrogen Cat#: A-11034)<br>6. Anti-Mouse Alexa 568 (Invitrogen Cat#: A-11031)<br>7. IRDye 800CW anti-Rabbit IgG (LiCor-Bio Cat#: 926-32211)<br>8. IRDye 800CW anti-Rat IgG (LiCor-Bio Cat#: 926-32219)<br>9. IRDye 700CW anti-Mouse IgG (LiCor-Bio Cat# 926-68070) |
| Validation | 1. Anti-CODANIN-1 (Abcam Cat#: Ab204392): Commercially validated, Suitable for WB, IHC-P and ICC/IF.<br>2. Anti-HA (BioLegend Cat# 901513): Commercially validated, Suitable for Flow Cyt, WB, IP, ICC/IF. Reacts with HA epitope tag/fusion protein.<br>3. Anti-Tubulin (Abcam Cat#: Ab6160): Commercially validated, Suitable for Flow Cyt, WB, IHC-P, ICC/IF. Reacts with Human, Mouse, Rat Tubulin.<br>4. Anti-ASF1A (Cell Signalling Cat#: 2990S): Commercially validated, Suitable for WB, IHC, IP, IF. Reacts with Human, Mouse, Monkey. Antibody does not cross-react with ASF1B.<br>5-6: Invitrogen fluorescent secondary antibodies were commercially validated by immunofluorescence.<br>7-9: IRDye secondary antibodies are commercially validated by western blot. |

## Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

| | |
|---|---|
| Cell line source(s) | 1. Spodoptera frugiperda 9 (Sf9, Thermo Fisher Scientific)<br>2. U-2 OS cell line (previous published experiments, Ask et. al., EMBO J., 2012) |
| Authentication | 1. Sf9 cell line: It was obtained from a commercial vendor, but they were not authenticated after receipt.<br>2. U-2 OS cell line: No further authentication for this study. |
| Mycoplasma contamination | No Mycoplasma contamination tests were performed in this study. |
| Commonly misidentified lines (See ICLAC register) | None. |

## Plants

| | |
|---|---|
| Seed stocks | n/a |
| Novel plant genotypes | n/a |
| Authentication | n/a |