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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 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

- Microsoft Excel; version 16.16.19 (200210) or newer
- Protein Data Bank (PDB); https://www.rcsb.org/
- Basic Local Alignment Search Tool (Nucleotide BLAST and Protein BLAST); https://blast.ncbi.nlm.nih.gov/Blast.cgi
- ClustalW2; https://www.ebi.ac.uk/Tools/msa/clustalw2/ (retired)
- Expasy Translate; https://web.expasy.org/translate/
- Expasy ProtParam tool; https://web.expasy.org/protparam/
- Magellan; version 7.2
- Unicorn; version 7.1
- BIAevaluation software; version 4.1
- Attune Cytometric Software; version 5.1.2111.1

Data analysis

- Microsoft Excel; version 16.16.19 (200210) or newer
- GraphPad Prism 9 software; version 9.0.0
- Unicorn; version 7.1
- BIAevaluation software; version 4.1
- PyMOL; version 2.5.2
- Winlist 3D; version 9.0.1
- IncuCyte S3; version 2021C

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 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

All data and materials in the main text and supplementary materials are available upon reasonable request to the corresponding author for the purposes of reproducing or extending the analysis. All requests will be reviewed to determine whether they are subject to confidentiality and data protection obligations. Data that can be shared will be made available through material transfer agreements.

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	Samples sizes were determined from previous studies and publications, and are relevant for animal experiments and cellular experiments. In addition, ethical perspectives was impotant in determining the sample size in animal experiments. Generally, 5 mice per group were used, which was calculated using power analysis. Unfortunatly, we experienced a reduction in mice for several experiements leaving the number of mice to low for statistical analysis.
Data exclusions	Data were excluded where the samples were found negative during analysis, but only where it was known to be due to human error during assay preparation, due to positive values in repeated assays. For example if sera from a specific mouse comes out negative for a target in an ELISA run, but is positive in repeated runs in ELISA and flow, that spcific mouse against that specific target in that specifc run will ble excluded. Another example of data exclusion is detection of obvious leaking from one chamber to the other in the transwell assay. Leaking was identified when the concentration of the opposite chamber was as high as the sample-adding chamber.
Replication	To ensure reproducability experiments were performed with two (biochemical) or three (cellular) technical replicates of each individual data point, and independent assays were run. For analysis of biological materials tests were performed twice when sufficient sample volume. Due to ethical considerations, animal experiements were performed only once.
Randomization	Samples were, where feasable, randomized in terms of location on plate/assay. Nevertheless, in big assay set ups (mostly during flow cytometry sample preparation) the samples were systemically placed in order to prevent data mix ups. Animals were placed into groups at a random basis, with some diviation for the experiment including male mice. In that case mice that were already housed together were used as one group.
Blinding	During several of the experiments the investigators were blinded, both during in vivo experiements and anayses. We saw no difference between blinded and non-blinded experiments/analyses.

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
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☐	☒ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used

Details for antibodies used in experimental analyses (Tradename; Supplier; Reference; Lot.nr; RRID):
- Influenza A H1N1 (A/Puerto Rico/8/1934) HA ELISA pair Set; Sino Biological; SEK11684; KW09MA2601; AB_2860373 & AB_2860372
- Anti-human albumin produced in goat; Sigma-Aldrich; A1151; SLCF5233; AB_257921
- Biotinylated anti-mouse IgG1; BD Pharmingen; 553500; 0227413; AB_394885
- Biotinylated anti-mouse IgG2a; BD Pharmingen; 553502; 9140827; AB_394887
- Biotinylated anti-mouse IgG2b; BD Pharmingen; 553393; 4276786; AB_394831
- ALP-conjugated anti-mouse IgA; Mabtech; 3865-9A; 43970
- Anti-Mouse IgG (Fc specific)-Alkaline Phosphatase antibody produced in goat; Sigma; A2429; 029M4801V; AB_258000
- Anti-Human IgG (Fc specific)-Alkaline Phosphatase antibody produced in goat; Sigma; A9544; 0000083102; AB_258459
- HRP-conjugated anti-mouse albumin; Abcam; ab19195; GR58744-1; AB_777887
- ALP-conjugated anti-human albumin produced in goat; Bethyl Laboratories; A80-229AP; 10; AB_67020
- R-Phycoerythrin-conjugated AffiniPure Goat Anti-Human IgG; Jackson ImmunoResearch; 109-115-098; 156407; AB_2337675
- Goat anti-Mouse IgG Fc Cross Absorbed Secondary Antibody, PE; Invitrogen; 31861; VH3058083A; AB_429715
- Rat Anti-Mouse IgG1-PE; SouthernBiotech; 1144-09; F2817-W077J; AB_2794641
- Rat Anti-Mouse IgG2a-PE; SouthernBiotech; 1155-09; L5719-MJ40Z; AB_2794650
- Rat Anti-Mouse IgG2b-PE; SouthernBiotech; 1186-09; J5813-M599S; AB_2794689
- Rat Anti-Mouse IgG3-PE; SouthernBiotech; 1191-09; C0514-PI30B; AB_2794696
- Anti-Mouse IgA mAb MT45A; Mabtech; 3865-3; 2
- IgG Fraction Monoclonal Mouse Anti-Digoxin; Jackson ImmunoResearch; 200-002-156; 161187; AB_2339005

Antibodies produced in-house (Name; batch):
- Anti-HA mAb (H-36-4-52); MB1. Kind gift from Siegfried Weiss, generation described in doi: 10.1084/jem.157.2.687
- Human IgG1 (anti-NIP) with Fc mutations (M252Y/S254T/T256E/H433K/N434F); 07/08/19. Generation described in doi: 10.4049/jimmunol.1401218

Validation

All antibodies (commersial and in-house) are widely used in the laboratory and are regularly tested against in-house samples of known effect. Any abnormal results are detected, tracked and reported (to manufacturer if necessary). In addition, the CoA of commercial antibodies are checked upon delivery.

Eukaryotic cell lines

Policy information about cell lines

Cell line source(s)

- HEK293E and HEK293T; ATCC
- Expi293F; Gibco
- HMEC-1-HA-FcRn-EGFP; Boston Children's Hospital, Harvard Medical School and Harvard Digestive Diseases Center, USA. Generation described in doi: 10.1091/mbc.E13-04-0174
- MDCKII-hFcRn; pRED Roche Innovation Center Munich, Germany
- 293T-hACE2-TMPRSS2; Protein and Nucleic Acid Chemistry Division, Medical Research Council, Laboratory of Molecular Biology, Cambridge, United Kingdom. Generation described in doi: 10.1371/journal.ppat.1009246

Authentication

Authentication of all cell lines: visual inspection of morphology, proliferation rate monitored.
- HEK293E and Expi293F; protein production rates of in-house standardized antibody variants monitored.
- HMEC-1-HA-FcRn-EGFP; FcRn expression validated by EGFP expression on FACS.
- MDCK-hFcRn; polarization rate and level monitored; transcellular transport of FcRn-negative antibody monitored.

Mycoplasma contamination

Cell lines tested negative for mycoplasma contamination.

Commonly misidentified lines
(See ICLAC register)

NA

Animals and other organisms

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

Laboratory animals

Laboratory animals:
Mice of the following strains:
- Balb/C, females aged 6-9 weeks, 4-12 mice/group
- Tg32 (B6.Cg-Fcgrttm1Dcr Tg(FCGRT)32Dcr/DcrJ), females aged 9-11 weeks, 5 mice/group
- Tg32-hFc (B6.Cg-Tg(FCGRT)32Dcr Fcgrttm1Dcr Ighg1em2(IGHG1)Mvw/MvwJ), males and females aged 6-13 weeks, 3-5 mice/group

Wild animals

The study did not include wild animals.

Field-collected samples

The study did not include field-collected samples.

Ethics oversight

The animal studies were carried out at The Section for Comparative Medicine, Oslo University Hospital (Rikshospitalet) in accordance with the national guidelines and regulations, and the experiements were approved by The Norwegian Food Safety Authority.

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	Sera were diluted in assay buffer as specified under "Materials and Methods" and incubated with bead based arrays.
Instrument	Attune NxT Acoustic Focusing Cytometer, Thermo Fisher Scientific
Software	Data collection: Attune Cytometric Software, Thermo Fisher Scientific. Analysis of FCS files: Windlist 3D, Verity Software House
Cell population abundance	NA
Gating strategy	FSC/SSC: Gating of single beads. Flourecent bar codes gating on: Bodipy, Cy5, Pacific Blue.

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