

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 (<i>n</i>) 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
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ 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. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ 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 <i>d</i> , Pearson's <i>r</i>), 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	ELISA data were collected by a microplate reader (Bio-Rad X-Mark spectrophotometer). Fractions density data were collected by refractometry (Abbe 60). Electron microscopy data were collected by analytical transmission electron microscope (Philips CM120). Flow cytometry was performed using LSRFortessa (BD Biosciences) or Attune NxT (Thermo Fisher Scientific). Cells sorting was performed using FACSARIA II (BD Biosciences). Immunohistochemistry images were captured with a BX63 Upright Microscope (Olympus). Immunofluorescent images were captured with a BX63 Upright Microscope (Olympus) equipped with a Prime BSI sCMOS Camera (Teledyne Photometrics). RNA-seq and scRNA-seq data were collected by Illumina NovaSeq 6000 System (Genengy Biotechnology).
Data analysis	FACS data were analyzed with FlowJo software (Tree Star, Inc. version 10.8.1). CLIA data were analyzed in GraphPad Prism (v. 8.4.3). Images analysis were quantified using QuPath (v.0.3.2) and CellSens (v.2.3). Statistical analysis was performed with GraphPad Prism (v. 8.4.3) and R softwares (v4.0.3) .

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](#)

Mouse bulk-RNA-seq data generated during this study have been deposited in the Gene Expression Omnibus (GEO) with the accession code GEO: GSE207539 [https://www.ncbi.nlm.nih.gov/geo/query/acc.cgi?acc=GSE207539]. ScRNA-seq data generated during this study have been deposited in the Gene Expression Omnibus (GEO) with the accession code GEO: GSE207541 [https://www.ncbi.nlm.nih.gov/geo/query/acc.cgi?acc=GSE207541] for mouse samples and Open Archive for Miscellaneous Data with the accession code OMIX ID: OMIX009529 [https://ngdc.cncb.ac.cn/omix/release/OMIX009529] for human specimens. 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

Male and female patients were enrolled and reported in this study. Their ages range from 23 to 58 year old. The sex and gender data were provided in Supplementary Table 1.

Reporting on race, ethnicity, or other socially relevant groupings

Race, ethnicity, or other socially relevant grouping were not distinguished and considered in this study.

Population characteristics

PBMCs samples were obtained from five acute hepatitis B (AHB) patients and five healthy donors (HD), of 1 AHB patient provided matched liver puncture biopsy specimen. The population characteristics of them are shown in Supplementary Table 1.

Recruitment

Acute hepatitis B patients and healthy donors were recruited from Huashan Hospital of Fudan University. Enrollment of acute hepatitis B patients was based on established clinical diagnostic criteria, and all patients provided informed consent for the use of residual cell samples and clinical data for research purposes.

Ethics oversight

The study was endorsed by the Institutional Review Board at Huashan Hospital (Ethics committee archiving No. KY2021-919).

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](https://www.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 sizes were determined based on technical feasibility of the experimental workflow being mindful to provide a reasonable number of replicates to be confident in obtained results. Sample sizes are reported in the figure legends section.

Data exclusions

Experiments were excluded that were technically invalid.

Replication

The experimental replicates are stated in the figure legends. All stated replicates indicate biological replicates.

Randomization

Age and sex matched mice were randomly allocated into experimental groups.

Blinding

Histological statistical analyses were performed blinded using QuPath and CellSens software.

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

Flow cytometry (Colour, Antibody, Clone, Lot No, Dilution, Supplier)
 Alexa Fluor 700 anti-mouse CD4 (GK1.5, 100430, 1:100, BioLegend); FITC anti-mouse CD4 (RM4-5, 553047, 1:100, BD Biosciences); PE anti-mouse CD4 (GK1.5, 100408, 1:100, BioLegend); Alexa Fluor 700 anti-mouse CD8α (53-6.7, 100730, 1:100, BioLegend); FITC anti-mouse CD8α (53-6.7, 100706, 1:100, BioLegend); PE/Cyanine7 anti-mouse CD8α (53-6.7, 100722, 1:100, BioLegend); APC anti-mouse CD45.1 (A20, 110714, 1:100, BioLegend); FITC anti-mouse CD45.1 (A20, 11-0453-85, 1:100, eBioscience); PE/Cyanine7 anti-mouse CD45.1 (A20, 110730, 1:100, BioLegend); Super Bright 436 anti-mouse CD45.1 (A20, 62-0453-82, 1:100, eBioscience); PerCP/Cyanine5.5 anti-mouse TCR Vα2 (B20.1, 127814, 1:100, BioLegend); PE anti-mouse TCR Vα2 (B20.1, 127808, 1:100, BioLegend); Biotin anti-mouse CD185 (CXCR5) (2G8, 551960, 1:100, BD Biosciences); Biotin anti-mouse CD45.1 (A20, 13-0453-85, 1:100, eBioscience); eFluor 506 anti-mouse CD45.1 (A20, 69-0453-82, 1:100, eBioscience); Biotin anti-mouse CD45.2 (104, 13-0454-85, 1:100, eBioscience); PE/Cyanine7 anti-mouse CD279 (PD-1) (RMP1-30, 109110, 1:100, BioLegend); Brilliant Violet 421 anti-T-bet (4B10, 644815, 1:100, BioLegend); APC anti-T-bet (4B10, 17-5825-82, 1:100, eBioscience); Alexa Fluor 647 anti-mouse/human Bcl6 (IG191E/A8, 648306, 1:100, BioLegend); Brilliant Violet 421 anti-mouse Bcl6 (K112-91, 563363, 1:100, BD Biosciences); PE/Cyanine7 anti-mouse Granzyme B (NGZB, 25-8898-82, 1:100, eBioscience); FITC anti-mouse I-Ab (AF6-120.1, 116406, 1:100, BioLegend); APC anti-mouse I-Ab (AF6-120.1, 116418, 1:100, BioLegend); PE/Cyanine7 anti-mouse CD11c (N418, 117318, 1:100, BioLegend); Brilliant Violet 510™ anti-mouse I-A/I-E (M5/114.15.2, 107636, 1:100, BioLegend); PerCP/Cyanine5.5 anti-mouse/human CD11b (M1/70, 101228, 1:100, BioLegend); FITC anti-mouse/human CD11b (M1/70, 101206, 1:100, BioLegend); PE anti-mouse CD103 (M290, 557495, 1:100, BD Biosciences); FITC anti-mouse CD103 (2E7, 121420, 1:100, BioLegend); PE anti-mouse/human CD45R/B220 (RA3-6B2, 103208, 1:100, BioLegend); Biotin anti-mouse CD197 (4B12, 120104, 1:50, BioLegend); FITC anti-human Ig light chain κ (MHK-49, 316506, 1:100, BioLegend); Biotin anti-human Ig light chain κ (MHK-49, 316504, 1:100, BioLegend); PE anti-mouse Nur77 (12.14, 12-5965-82, 1:100, eBioscience); PE anti-mouse CD69 (H1.2F3, 12-0691-82, 1:100, eBioscience); APC anti-mouse CD64 (X54-5/7.1, 139306, 1:100, BioLegend); Alexa Fluor 647 anti-mouse CD31 (MEC13.3, 102516, 1:200, BioLegend); PE anti-mouse IFN-γ (XMG1.2, 505810, 1:100, BioLegend); APC anti-mouse MHC Class I (H-2Kb) (AF6-88.5.5.3, 17-5958-82, 1:100, eBioscience); Super Bright 436 anti-mouse MHC Class I (H-2Kd) (SF1-1.1.1, 62-5957-82, 1:100, eBioscience); PE anti-mouse H-2Kb bound to SIINFEKL (25-D1.16, 141604, 1:100, BioLegend); Alexa Fluor 700 anti-mouse CD3 (17A2, 100216, 1:100, BioLegend); Biotin anti-mouse CD3 antibody (17A2, 100244, 1:100, BioLegend); APC Hamster anti-mouse CD3e (145-2C11, 1:100, 553066, BD Biosciences).

Immunofluorescence and immunohistochemistry (Colour, Antibody, Clone, Lot No, Dilution, Supplier)
 Super Bright 436 anti-mouse CD45R (B220) (RA3-6B2, 62-0452-82, 1:100, eBioscience); Alexa Fluor 647 anti-mouse CD45.1 (A20, 110720, 1:100, BioLegend); FITC anti-mouse IgD (11-26c, 11-5993-85, 1:100, eBioscience); APC anti-mouse CD45.2 (104, 109814, 1:100, BioLegend); Anti-idiotypic antibody 35.61 (1:100, European Virus Archive Global); Rabbit anti Hepatitis B Surface Antigen (Polyclonal, OBT0990, 1:100, Bio-Rad); Peroxidase AffiniPure Donkey anti-Rabbit IgG (H+L) (711-035-152, 1:200, Jackson ImmunoResearch Labs); Peroxidase-AffiniPure Goat anti-Mouse IgG (H+L) (115-035-003, 1:10000, Jackson ImmunoResearch Labs); Peroxidase IgG Fraction Monoclonal mouse anti-Fluorescein (FITC) (200-032-037, 1:200, Jackson ImmunoResearch Labs); Alkaline Phosphatase Streptavidin (016-050-084, 1:200, Jackson ImmunoResearch Labs); Alexa Fluor 488 IgG Fraction Monoclonal mouse anti-Fluorescein (FITC) (200-542-037, 1:200, Jackson ImmunoResearch Labs); Alexa Fluor 488 AffiniPure Donkey Anti-Rabbit IgG (H+L) (711-545-152, 1:200, Jackson ImmunoResearch Labs); Cy3 IgG Fraction Monoclonal mouse anti-biotin (200-162-211, 1:200, Jackson ImmunoResearch Labs); Cy3 AffiniPure Goat Anti-Rat IgG (H+L) (112-165-167, 1:200, Jackson ImmunoResearch Labs).

In vivo block or depletion (Antibody, Clone, Lot No, Supplier)
 InVivoMAb anti-mouse L-Selectin (CD62L) (Mel-14, BE0021, BioXCell); InVivoMAb anti-mouse LFA-1α (CD11a) (M17/4, BE0006, BioXCell); InVivoMAb anti-mouse ICOS (7E.17G9, BE0059, BioXCell); InVivoMAb anti-mouse CLEC9A (CD370) (7H11, BE0305, BioXCell); Mouse XCL1/Lymphotactin Antibody (80222, MAB486, R&D Systems).

Single cell RNA sequencing hashtags (Antibody, Supplier, Clone (Catalogue #) Dilution, Lot No.)
 TotalSeq-B0303 anti-mouse Hashtag 3 (155835, 1:100, BioLegend); TotalSeq-B0304 anti-mouse Hashtag 4 (155837, 1:100, BioLegend); TotalSeq-C0251 anti-human Hashtag 1 (394661, 1:100, BioLegend); TotalSeq-C0252 anti-human Hashtag 2 (394663, 1:100, BioLegend); TotalSeq-C0253 anti-human Hashtag 3 (394665, 1:100, BioLegend)

Validation

Alexa Fluor 700 anti-mouse CD4: <https://www.biolegend.com/en-us/products/alexa-fluor-700-anti-mouse-cd4-antibody-3385>
 FITC anti-mouse CD4: <https://www.bdbiosciences.com/en-us/products/reagents/flow-cytometry-reagents/research-reagents/single-color-antibodies-ruo/fic-rat-anti-mouse-cd4.553047>
 PE anti-mouse CD4: <https://www.biolegend.com/en-us/products/pe-anti-mouse-cd4-antibody-250>
 Alexa Fluor 700 anti-mouse CD8α: <https://www.biolegend.com/en-us/products/alexa-fluor-700-anti-mouse-cd8a-antibody-3387>
 FITC anti-mouse CD8α: <https://www.biolegend.com/en-us/products/fic-anti-mouse-cd8a-antibody-153>

APC anti-mouse CD45.1: <https://www.biolegend.com/en-us/products/apc-anti-mouse-cd45-1-antibody-2319>
 FITC anti-mouse CD45.1: <https://www.thermofisher.com/antibody/product/CD45-1-Antibody-clone-A20-Monoclonal/11-0453-85>
 PE/Cyanine7 anti-mouse CD45.1: <https://www.biolegend.com/en-us/products/pe-cyanine7-anti-mouse-cd45-1-antibody-4917>
 Super Bright 436 anti-mouse CD45.1: <https://www.thermofisher.com/antibody/product/CD45-1-Antibody-clone-A20-Monoclonal/62-0453-82>
 PerCP/Cyanine5.5 anti-mouse TCR Vα2: <https://www.biolegend.com/en-us/products/percp-cyanine5-5-anti-mouse-tcr-valpha2-antibody-4872>
 PE anti-mouse TCR Vα2: <https://www.biolegend.com/en-us/products/pe-anti-mouse-tcr-valpha2-antibody-4807>
 Biotin anti-mouse CD185 (CXCR5): <https://www.bdbiosciences.com/en-us/products/reagents/flow-cytometry-reagents/research-reagents/single-color-antibodies-ruo/biotin-rat-anti-mouse-cd185-cxcr5.551960>
 Biotin anti-mouse CD45.1: <https://www.thermofisher.com/antibody/product/CD45-1-Antibody-clone-A20-Monoclonal/13-0453-85>
 eFluor 506 anti-mouse CD45.1: <https://www.thermofisher.com/antibody/product/CD45-1-Antibody-clone-A20-Monoclonal/69-0453-82>
 Biotin anti-mouse CD45.2: <https://www.thermofisher.com/antibody/product/CD45-2-Antibody-clone-104-Monoclonal/13-0454-85>
 PE/Cyanine7 anti-mouse CD279 (PD-1): <https://www.biolegend.com/en-us/products/pe-cyanine7-anti-mouse-cd279-pd-1-antibody-3612>
 Brilliant Violet 421 anti- T-bet: <https://www.biolegend.com/en-us/products/brilliant-violet-421-anti-t-bet-antibody-7281>
 APC anti-T-bet: <https://www.thermofisher.com/antibody/product/T-bet-Antibody-clone-eBio4B10-4B10-Monoclonal/17-5825-82>
 Alexa Fluor 647 anti-mouse/human Bcl6: <https://www.biolegend.com/en-us/products/alexa-fluor-647-anti-mouse-human-bcl-6-antibody-11938>
 Brilliant Violet 421 anti-mouse Bcl6: <https://www.bdbiosciences.com/en-us/products/reagents/flow-cytometry-reagents/research-reagents/single-color-antibodies-ruo/bv421-mouse-anti-bcl-6.563363>
 PE/Cyanine7 anti-mouse Granzyme B: <https://www.thermofisher.com/antibody/product/Granzyme-B-Antibody-clone-NGZB-Monoclonal/25-8898-82>
 FITC anti-mouse I-Ab: <https://www.biolegend.com/en-us/products/fitc-anti-mouse-i-ab-antibody-1740>
 APC anti-mouse I-Ab: <https://www.biolegend.com/en-us/products/apc-anti-mouse-i-ab-antibody-6597>
 PE/Cyanine7 anti-mouse CD11c: <https://www.biolegend.com/en-us/products/pe-cyanine7-anti-mouse-cd11c-antibody-3086>
 PerCP/Cyanine5.5 anti-mouse/human CD11b: <https://www.biolegend.com/en-us/products/percp-cyanine5-5-anti-mouse-human-cd11b-antibody-4257>
 FITC anti-mouse/human CD11b: <https://www.biolegend.com/en-us/products/fitc-anti-mouse-human-cd11b-antibody-347>
 PE anti-mouse CD103: <https://www.bdbiosciences.com/en-us/products/reagents/flow-cytometry-reagents/research-reagents/single-color-antibodies-ruo/pe-rat-anti-mouse-cd103.557495>
 FITC anti-mouse CD103: <https://www.biolegend.com/en-us/products/fitc-anti-mouse-cd103-antibody-7053>
 PE anti-mouse/human CD45R/B220: <https://www.biolegend.com/en-us/products/pe-anti-mouse-human-cd45r-b220-antibody-447>
 PerCP/Cyanine5.5 anti-mouse CD45R (B220): <https://www.thermofisher.com/antibody/product/CD45R-B220-Antibody-clone-RA3-6B2-Monoclonal/45-0452-82>
 FITC anti-human Ig light chain κ: <https://www.biolegend.com/en-us/products/fitc-anti-human-ig-light-chain-kappa-antibody-3297>
 Biotin anti-human Ig light chain κ: <https://www.biolegend.com/en-us/products/biotin-anti-human-ig-light-chain-kappa-antibody-3296>
 PE anti-mouse CD69: <https://www.thermofisher.com/antibody/product/CD69-Antibody-clone-H1-2F3-Monoclonal/12-0691-82>
 APC anti-mouse CD64: <https://www.biolegend.com/en-us/products/apc-anti-mouse-cd64-fcgmari-antibody-7874>
 Alexa Fluor 647 anti-mouse CD31: <https://www.biolegend.com/en-us/products/alexa-fluor-647-anti-mouse-cd31-antibody-3094>
 PE anti-mouse IFN-γ: <https://www.thermofisher.com/antibody/product/IFN-gamma-Antibody-clone-XMG1-2-Monoclonal/12-7311-82>
 PE anti-mouse IgD: <https://www.bdbiosciences.com/en-us/products/reagents/flow-cytometry-reagents/research-reagents/single-color-antibodies-ruo/pe-rat-anti-mouse-igd.558597>
 APC anti-mouse MHC Class I (H-2Kb): <https://www.thermofisher.com/antibody/product/MHC-Class-I-H-2Kb-Antibody-clone-AF6-88-5-5-3-Monoclonal/17-5958-82>
 Super Bright 436 anti-mouse MHC Class I (H-2Kd): <https://www.thermofisher.com/antibody/product/MHC-Class-I-H-2Kd-Antibody-clone-SF1-1-1-1-Monoclonal/62-5957-82>
 PE anti-mouse H-2Kb bound to SIINFEKL: <https://www.biolegend.com/en-us/products/pe-anti-mouse-h-2kb-bound-to-siinfekl-antibody-7247>
 Alexa Fluor 700 anti-mouse CD3: <https://www.biolegend.com/en-us/products/alexa-fluor-700-anti-mouse-cd3-antibody-3375>
 Super Bright 436 anti-mouse CD45R (B220): <https://www.thermofisher.com/antibody/product/CD45R-B220-Antibody-clone-RA3-6B2-Monoclonal/62-0452-82>
 Alexa Fluor 647 anti-mouse CD45.1: <https://www.biolegend.com/en-us/products/alexa-fluor-647-anti-mouse-cd45-1-antibody-3104>
 FITC anti-mouse IgD: <https://www.thermofisher.com/antibody/product/IgD-Antibody-clone-11-26c-11-26-Monoclonal/11-5993-85>
 APC anti-mouse CD45.2: <https://www.biolegend.com/en-us/products/apc-anti-mouse-cd45-2-antibody-2759>
 Rabbit anti Hepatitis B Surface Antigen: https://www.bio-rad.com/SearchResults?search_api_fulltext=OBT0990
 Peroxidase AffiniPure Donkey anti-Rabbit IgG (H+L): <https://www.jacksonimmuno.com/catalog/products/711-035-152>
 Peroxidase-AffiniPure Goat anti-Mouse IgG (H+L): <https://www.jacksonimmuno.com/catalog/products/115-035-003>
 Peroxidase IgG Fraction Monoclonal mouse anti-Fluorescein (FITC): <https://www.jacksonimmuno.com/catalog/products/200-032-037>
 Peroxidase AffiniPure Goat Anti-Mouse IgM, μ Chain Specific: <https://www.jacksonimmuno.com/catalog/products/115-035-020>
 Alkaline Phosphatase Streptavidin: <https://www.jacksonimmuno.com/catalog/products/016-050-084>
 Alexa Fluor 488 IgG Fraction Monoclonal mouse anti-Fluorescein (FITC): <https://www.jacksonimmuno.com/catalog/products/200-542-037>
 Alexa Fluor 488 AffiniPure Donkey Anti-Rabbit IgG (H+L): <https://www.jacksonimmuno.com/catalog/products/711-545-152>
 Cy3 IgG Fraction Monoclonal mouse anti-biotin: <https://www.jacksonimmuno.com/catalog/products/200-162-211>
 Cy3 AffiniPure Goat Anti-Rat IgG (H+L): <https://www.jacksonimmuno.com/catalog/products/112-165-167>
 InVivoMAb anti-mouse L-Selectin (CD62L): <https://bioxcell.com/invivomab-anti-mouse-l-selectin-cd62l-be0021>
 InVivoMAb anti-mouse LFA-1α (CD11a): <https://bioxcell.com/invivomab-anti-mouse-lfa-1a-cd11a-be0006>
 InVivoMAb anti-mouse/human VLA-4 (CD49d): <https://bioxcell.com/invivomab-anti-mouse-human-vla-4-cd49d-be0071>
 InVivoMAb anti-mouse ICOS: <https://bioxcell.com/invivomab-anti-mouse-icos-be0059>
 InVivoMAb anti-mouse CLEC9A (CD370): <https://bioxcell.com/invivomab-anti-mouse-clec9a-cd370-be0305>
 Mouse XCL1/Lymphotactin Antibody: https://www.rndsystems.com/products/mouse-xcl1-lymphotactin-antibody-80222_mab486
 TotalSeq-B0303 anti-mouse Hashtag 3: <https://www.biolegend.com/en-us/products/totalseq-b0303-anti-mouse-hashtag-3->

antibody-17773
 TotalSeq-B0304 anti-mouse Hashtag 4: <https://www.biolegend.com/en-us/products/totalseq-b0304-anti-mouse-hashtag-4-antibody-17774>
 TotalSeq-C0251 anti-human Hashtag 1: <https://www.biolegend.com/en-us/products/totalseq-c0251-anti-human-hashtag-1-antibody-17162>
 TotalSeq-C0252 anti-human Hashtag 2: <https://www.biolegend.com/en-us/products/totalseq-c0252-anti-human-hashtag-2-antibody-17163>
 TotalSeq-C0253 anti-human Hashtag 3: <https://www.biolegend.com/en-us/products/totalseq-c0253-anti-human-hashtag-3-antibody-17164>

Eukaryotic cell lines

Policy information about [cell lines and Sex and Gender in Research](#)

Cell line source(s) Human hepatoma cell line Huh-7 (Cell Bank/Stem Cell Bank, Chinese Academy of Sciences).

Authentication Morphological shape of cell lines was monitored via microscopes.

Mycoplasma contamination Cell line was tested negative for mycoplasma.

Commonly misidentified lines (See [ICLAC](#) register) There is no commonly misidentified line used 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 The HBsAg-specific Ig knock-in S129G1HL mice were generated by CRISPR-Cas9-mediated targeting of a bicistronic allele encoding both the light and the heavy Ig chains to the endogenous Igh locus as previously described⁸², with the assistance from Cyagen Biosciences. The light and heavy Ig chains were derived from the 129G1 monoclonal antibody recognizing a linear epitope located at amino acids 137-151 of HBsAg53, with a HuCk used for subsequent identification of cells bearing the transgenic receptor. The S129G1HL allele can be identified by PCR using the primer sets: S129G1HL_Foward: 5'-CTGATAGGCACCCAAGTACACTA-3', S129G1HL_Reverse: 5' GCTATAGCAACCACTGTAGGTG -3'. The Ebi2^{-/-} mice were generated by CRISPR-Cas9-mediated homologous recombination in mouse ES cells on an albino C57BL/6 background with the assistance from Cyagen Biosciences. The EBI2 Mutant allele can be distinguished from the WT allele by PCR using the primer sets: EBI2_Common_Foward: 5'-CAGCTGGTGTAGGTACACACTAC-3', EBI2_Wildtype_Reverse: 5'-CTCCGTATGACACACAATCATC-3' and EBI2_Mutant_Reverse: 5'-TTCAGTGTGCAATTCCCTCG-3'. WT C57BL/6 mice (stock No. N000013) and BALB/c mice (stock No. N000020) were purchased from GemPharmatech. CD45.1+ congenic C57BL/6 mice (stock No. 002014), Irf4fl/fl mice (stock No. 009380), B cell-deficient μ MT mice (stock No. 002288), MHC-II^{-/-} mice (stock No. 003584), HBV Env28 TCR transgenic mice (stock No. 027510), Zbtb46-DTR (stock No. 019506) for the specific depletion of cDCs, cDC1-deficient Batf3^{-/-} mice (stock No. 013755), monocyte-deficient Ccr2^{-/-} mice (stock No. 004999), OVA-specific TCR transgenic OT-II mice (stock No. 004194) and OT-I mice (stock No. 003831), HEL-specific BCR transgenic MD4 mice (stock No. 002595), LCMV GP61-80 TCR-specific transgenic SMARTA mice (stock No. 030450), LCMV GP33-41 TCR-specific transgenic P14 mice (stock No. 037394), and C3^{-/-} mice (stock No. 029661) were purchased from the Jackson Laboratory. ItgaxCre mice was purchased from Shanghai Model Organisms. VSV-specific BCR transgenic VI10YEN mice were provided by M. Iannacone. HEL-specific BCR knock-in Hy10 mice were provided by J. Cyster. H2-Ab1fl/flylMyc mice, with Mhc-II conditional knockout in phagocytes, were provided by T. Deng. Rab27afl/flRosa26CreERT2 mice, with the tamoxifen-induced knockout of Rab27a, were provided by Z. Cai. FcγRIIB^{-/-} mice were provided by F. Li. β2M^{-/-} mice, characterized by severely diminished MHC-I expression, were provided by S. Yu. F1 (C57BL/6 X BALB/c) mice were provided by C. Duan. Irf4fl/fl mice were crossed to ItgaxCre mice to obtain cDC2-deficient Irf4fl/flCD11cCre mice. Bone marrow chimeras were generated as previously described⁵² and subsequently analyzed after a period of 6-12 weeks.

Wild animals No wild animals were employed in the study.

Reporting on sex Male mice were used in the study.

Field-collected samples The study did not involve samples collected from the field.

Ethics oversight All the animal studies were approved by the Ethics Committee of School of Basic Medical Sciences, Fudan University (Approval No: 20190221-098) and the Ethics Committee of Pudong Hospital, Shanghai (Approval No: 2021-DS-M-20).

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

Clinical data

Policy information about [clinical studies](#)

All manuscripts should comply with the ICMJE [guidelines for publication of clinical research](#) and a completed [CONSORT checklist](#) must be included with all submissions.

Clinical trial registration No human clinical trial were used in this study.

Study protocol	No human clinical trial were used in this study.
Data collection	No human clinical trial were used in this study.
Outcomes	No human clinical trial were used in this study.

Plants

Seed stocks	No plants were used in this study.
Novel plant genotypes	No plants were used in this study.
Authentication	No plants were used in this study.

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	Mouse single cell suspensions of spleens and dLNs were generated by mechanical dissociation of spleens and LNs in FACS buffer [PBS, 2% FBS (Biological Industries), 2 mM EDTA]. The resulting cell suspensions were filtered through a 70-µm nylon strainer (BD Falcon). Liver lymphocytes were isolated using Percoll gradient centrifugation. In briefly, after perfusion with 30 ml PBS via portal vein, mouse liver fragments were pressed through a 100-µm nylon strainer (BD Falcon). Total liver cells were then resuspended in a 40% isotonic Percoll solution (GE Healthcare). After centrifugation for 20 minutes at 2000 rpm without brake, mononuclear cells and red blood cells (RBCs) were isolated at the bottom of centrifuge tube. After RBC lysis with RBC lysis buffer for 3 min on ice, the cells were washed once with RPMI1640 (Gibco BRL) supplemented with 2% FBS for antibody staining. For human specimens, frozen samples were thawed, recovered and washed using RPMI1640 medium supplemented with 10% FBS, and then supplemented with 2% FBS for antibody staining.
Instrument	For flow cytometry: LSRFortessa (BD Biosciences); Attune NxT (Thermo Fisher Scientific). For cell sorting: FACSAria II (BD Biosciences).
Software	Data was acquired using BD FACSDiva Software v9.1, and analyzed using FlowJo software (Tree Star, Inc. version 10.8.1).
Cell population abundance	The frequency of the purity for the populations of interest are specified in the appropriate figures/methods.
Gating strategy	Cells were first gated for FSC/SSC, doublets were excluded based on FSC and SSC W/H parameters. Viable cells were identified using live/dead viability dye eFour780. Positive populations were determined by the specific antibodies, which were distinct from negative populations. Transferred OT-II T cells analysis was gated on Live/Dead Dye-neg., CD4-pos., CD45.1-pos., TCR Vα2-pos. events. Endogenous CD4 T cells analysis was gated on Live/Dead Dye-neg., CD3-pos., CD4-pos. events. Transferred OT-I T cells analysis was gated on Live/Dead Dye-neg., CD8-pos., CD45.1-pos., TCR Vα2-pos. events. cDC1 cells analysis was gated on Live/Dead Dye-neg., MHCII-pos., CD11c-pos., CD11b-neg., CD103-pos. events. Transferred S129G1HL B cells analysis was gated on Live/Dead Dye-neg., CD45.1-pos., HuCk-pos. events. Mig-cDC1 analysis was gated on Live/Dead Dye-neg., MHCII-pos., CD11c-pos., CD11b-neg., CD103-pos., CCR7-pos. events. cDC2 cells analysis was gated on live/Dead Dye-neg., MHCII-pos., CD11c-high., CD11b-pos. CD103-neg. events. Kuffer cells analysis was gated on live/Dead Dye-neg., F4/80-pos., CD11b-neg. events. LSECs cells analysis was gated on live/Dead Dye-neg., CD31-pos. events Transferred Hy10 B cells analysis was gated on Live/Dead Dye-neg., CD45.1-pos., HEL-pos. events.

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