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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	No software was used for data collection in present study.
Data analysis	The RdRp amino acid sequences of CMNV, including those obtained in this study and others retrieved from the GenBank database, were aligned using ClustalW. A phylogenetic tree was constructed using the neighbor-joining method with bootstrap analysis (1000 replicates) in MEGA 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

At the outset of the trial, the informed consent documents signed by participants did not include data-sharing provisions. In accordance with ethics and institutional policies, we are not authorised to release individual-level or pseudo-anonymised datasets to the public. To protect participant privacy, only de-identified,

aggregated, group-level data (without background or individual-level information) is available. These data can be requested from the corresponding author (zhangql@ysfri.ac.cn) and will typically be provided within 2–4 weeks, subject to review to ensure compliance with applicable ethics requirements. Source data are provided with this paper.
Source data are provided with this paper or in https://doi.org/10.57760/sciencedb.34717.

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	The study only used the term "sex" (a biological attribute).
Reporting on race, ethnicity, or other socially relevant groupings	Seventy patients diagnosed with POH-VAU, 34 non-POH-VAU patients and 27 healthy volunteers were recruited from the Eye Institute Affiliated to Shandong First Medical University (Qingdao Eye Hospital), and the Eye Hospital of Shandong First Medical University, and all the information about the population have been listed in Extended Data Fig. 5 and Extended Data Fig. 6.
Population characteristics	Seventy patients diagnosed with POH-VAU were recruited from the Eye Institute Affiliated to Shandong First Medical University (Qingdao Eye Hospital), and the Eye Hospital of Shandong First Medical University. For the control groups, 34 non-POH-VAU patients who sought treatment at the same hospitals during the same period were included, along with 27 healthy volunteers who were recruited from the same hospitals.
Recruitment	Between January 2022 and April 2025, 70 patients diagnosed with POH-VAU were recruited from the Eye Institute Affiliated to Shandong First Medical University (Qingdao Eye Hospital), and the Eye Hospital of Shandong First Medical University. The diagnostic criteria for POH-VAU included (a) recurrent (>1 episode) mild anterior uveitis; (b) elevated IOP (>21 mmHg) during attacks that were difficult to control (requiring long-term medication or antiglaucoma surgery); (c) keratic precipitates of various shapes (fine, focal, mutton-fat, or stellate); (d) absence of iris posterior synechiae or peripheral anterior synechiae; (e) mild or no iris stromal atrophy; and (f) mild or no posterior inflammation. The diagnosis was confirmed by meeting all three of the first criteria (a, b, and c) plus any two of the remaining criteria (d, e, and f). Seventy patients meeting the clinical diagnostic criteria for POH-VAU were selected for in-depth analysis and treatment follow-up. For the control groups, 34 non-POH-VAU patients who sought treatment at the same hospitals during the same period were included, along with 27 healthy volunteers who were recruited from the same hospitals. The inclusion criteria for non-POH-VAU controls were as follows: (a) absence of anterior uveitis; (b) absence of keratic precipitates; (c) absence of iris posterior synechiae; (d) absence of iris stromal atrophy; and (e) absence of posterior inflammation. The inclusion criteria for healthy volunteers were (a) low exposure risk in the questionnaire survey and (b) no obvious ocular diseases. Organic eye lesions were ruled out by ophthalmological examination in all 27 healthy volunteers, and the absence of eye disease history was confirmed through questionnaires.
Ethics oversight	This study adhered to the ethical standards of the Declaration of Helsinki and was approved by the Ethics Committee of Qingdao Eye Hospital Affiliated to Shandong First Medical University (Approval No. 202119).

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	Clinical features of POH-VAU are recurrent episodes of anterior uveitis accompanied by extremely elevated intraocular pressure (IOP), keratic precipitates (KPs), and aqueous chamber cells. Repeated multiple episodes eventually lead to persistent IOP elevation, irreversible optic nerve damage, corneal endothelium reduction, iris atrophy, and significant damage of visual function. Keratic precipitates appear polymorphic and in vivo confocal microscopy reveals various morphological manifestations of the corneal endothelium. Based on these clinical features, we define POH-VAU as recurrent anterior uveitis with persistent ocular hypertension, without any obvious cause. To investigate POH-VAU, 104 patients were examined. Among them, 70 patients met the clinical diagnostic criteria for POH-VAU patients and were included for further analysis of therapeutics response, and the remaining 34 were classified as non POH-VAU. The 34 non-POH-VAU and other 27 healthy individuals (with no obvious ocular disease) were included in the control group for relevant analysis and research.
Data exclusions	During the data cleaning process of the online questionnaire survey involving 597 participants, we excluded a very small number (n=4) of outlier data points reporting the proportion of POH-VAU among ophthalmic clinical patients as equal to or greater than 100%. The fundamental reason lies in the epidemiological definition of the proportion of POH-VAU among ophthalmic clinical patients: it represents the percentage of POH-VAU cases relative to the total surveyed population within a specific timeframe, with a theoretical upper limit of 100%. Values >100% in the reports indicate that respondents may have erroneously reported the number of cases (rather than the proportion) or made other errors in understanding/entering the metric. To ensure the internal consistency and scientific validity of the research data, we excluded these clearly illogical data points based on this predefined objective criterion (i.e., proportion >100% is an invalid value). This

	measure constitutes essential quality control for data integrity, does not affect the overall validity or representativeness of the data, and all statistical analyses were conducted on the cleaned dataset.
Replication	All experiments were repeatable in the study.
Randomization	In the in vivo mice study to determine whether CMNV infection causes ocular hypertension and histopathological changes, individual mice were randomly assigned to experimental groups.
Blinding	The investigators were blinded to group allocation during data collection and/or 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	Applicable for ELISA test Provide supplier name: Qingdao Shuojing Biotechnology Co., Ltd. Catalog number: M1310 for Mouse anti-human IgG monoclonal antibody 43; P1301H for Goat anti-mouse – HRP. Clone name: 43 for Mouse anti-human IgG monoclonal antibody 43 Lot number: 240102 for Mouse anti-human IgG monoclonal antibody 43; 20240901 for Goat anti-mouse – HRP.
Validation	All primary antibodies used in this study (mouse-derived anti-human IgG and IgM monoclonal antibodies) were validated using product data provided by the manufacturer: both the IgG antibody (M1310) and the IgM antibody (M1302) showed ≥95% purity as determined by SDS-PAGE, were formulated in 10mM PBS (pH7.4) buffer, and can be stored stably at -20±5°C for 3 years. Detailed validation information is available in the manufacturer's official product documentation (WeChat Mini Program : Shuojing Biology), and the quality parameters support the specificity and reliability of the antibodies in this study.

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	The Vero cell lineage was isolated from kidney epithelial cells extracted from an African green monkey (Chlorocebus sp., female). The human corneal epithelial cell (HCEC) cell line was a gift from the laboratory of Dr.Choun-Ki Joo at The Catholic University of Korea, School of Medicine, Seoul, Korea.
Authentication	The Vero cell lineage was a commercial cell purchased from Wuhan Pricella Biotechnology Co., Ltd. (Item No. CL-0242), and the company provided the authentication for the cell lineage. The HCEC lineage were authenticated by Shandong Gene and Cell Resources Bank in China.
Mycoplasma contamination	The Vero cell lineage was a commercial cell purchased from Wuhan Pricella Biotechnology Co., Ltd. (Item No. CL-0242), and the company demonstrated that the cells were free of mycoplasma contamination. The HCEC cell were free of mycoplasma contamination authenticated by Shandong Gene and Cell Resources Bank in China.
Commonly misidentified lines (See ICLAC register)	We declare that no misidentified cell lines were used in this 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	C57BL/6JNifdc male mice (SPF), aged 8 weeks, were purchased from Shandong TEKE Biotechnology Co., Ltd. and housed at the

Laboratory animals	Ophthalmology Institute affiliated with Shandong First Medical University. All mice were maintained under specific pathogen-free conditions.
Wild animals	This study did not include research on wild mammals. In the study, small marine crustaceans used for epidemiological studies and finfish collected from aquatic products markets and fish farmers were sacrificed in accordance with local animal welfare regulations.
Reporting on sex	Sex was not considered in the in vivo study by using mice to determine whether infection with CMNV causes ocular hypertension and histopathological changes.
Field-collected samples	Sampling method in the fields: (1)Sampling in seas. Randomly, five to ten individuals of the dominant species of marine crustaceans were collected and sampled at every sampling site based on the catch. The cephalothorax, abdominal muscle, or the whole individual of each sample was divided equally into two aliquots along the longitudinal axis and one part was preserved in 4% paraformaldehyde (4% PFA) solution (Sinopharm, Beijing, China). The second part was then cut into two parts and preserved respectively in RNAstore solution (Tiangen, Beijing, China) and 2.5% glutaraldehyde solution (Sinopharm, Beijing, China). In order to avoid potential cross-contamination during the process of sample collection and dissection, disposable tools including scalpel, plastic gloves, and plastic tweezers, were applied for each sample respectively. The rest part of each individual was homogenized roughly and smeared on Whatman FTA Elute cards (GE Healthcare Life Sciences, Marlborough, MA, USA). Each FTA Elute card was air dried for 30 minutes separately, then placed in the independent plastic bag, sealed, and stored at -20 ºC. These samples were processed for further analysis based on molecular, histopathological, and electron microscopic procedures. (2)Sampling in ponds and aquatic product market. Live aquaculture animals were collected from the farming ponds and aquatic product market. Each sample was divided into four parts and preserved respectively in RNAlater solution (Qiagen GmbH, Hilden, Germany), 4% PFA solution, 2.5% glutaraldehyde solution, and FTA cards. The samples from two coastal provinces of South China were collected in 2016, and the sample were divided into four parts and preserved respectively in RNAlater solution, 4% PFA solution, 2.5% glutaraldehyde solution, and 95% ethanol.
Ethics oversight	Animal studies were conducted in accordance with local regulations and were approved by the hospital's animal experimentation authority (Approval number: [2024]13).

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

Plants

Seed stocks	Uninvolved.
Novel plant genotypes	Uninvolved.
Authentication	Uninvolved.