

Corresponding author(s): Byung-Ok Choi, Sang-Woo Kim

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Reporting Summary

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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

Electrical characterization data were collected using Tektronix oscilloscope data saving software. The axon length of the nervous tissue was measured using ZEISS ZEN (blue edition) to perform histopathological studies. Micro-CT images were taken using Skyscan 1276 (Bruker). The following softwares were used to conduct micro-CT image processing: NRecon (Bruker) for the reconstruction process, CTAn software (Bruker) for the analysis of reconstructed images, and CTVox software (Bruker) for the 3D-rendering process.

Data analysis

Electrical characterization data were analyzed using OriginPro 9.0 and Microsoft Excel (Version 16.71, 23031200). Material characterization data were analyzed using OriginPro 9.0 and Microsoft Excel (Version 16.71, 23031200). FEM simulations performed in this work were carried out using COMSOL Multiphysics (Version 5.5). All the statistical analysis were conducted using Prism 9 software (Version 9.5.0, GraphPad).

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](#)

The authors declare that all data supporting the findings of this study are available within the paper and its Supplementary Information. The raw and analyzed datasets generated during the study are available from the corresponding authors on reasonable request.

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender

Population characteristics

Recruitment

Ethics oversight

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

Data exclusions

Replication

Randomization

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

Methods

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

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 10-week-old C57BL/6J and CrOri:CD1(ICR) females were prepared and provided with a standard diet and water ad libitum, and housed in a temperature-controlled (22 ± 2) °C and humidity-controlled (44–56) % environment with a 12 h light–dark cycle. The C22 mice [B6; CBACa-Tg (PMP22) C22Clh/H], which harbor seven copies of a human PMP22 transgene (Huxley et al., 1996), were obtained from MRC Harwell (Oxfordshire, UK; IMSR Cat# HAR:784, RRID: IMSR_HAR:784). The C22 and wild type (WT) mice were produced by in vitro fertilization using 10-week-old C57BL/6J females (OrientBio, Republic of Korea) and 12-week-old C22 males (Macrogen, RRID:SCR_014454). Animals were provided with a standard diet and water ad libitum, and housed in a temperature-controlled (22 ± 2) °C and humidity-controlled (44–56) % environment with 12 h light–dark cycle. Male C22 or WT littermates were used for experiments when they were three weeks old.

Wild animals

The study did not involve wild animals.

Reporting on sex

Thirty C57BL/6J and twenty CrOri:CD1(ICR) mice were all females.
Thirty C22 mice were made of 20 females and 10 males.

Field-collected samples

The study did not involve field-collected samples.

Ethics oversight

All procedures including electrical characterization, surgical processes, in vivo demonstration, and biosignal monitoring of the experimental subjects were performed according to protocols approved by the Institutional Animal Care and Use Committee (IACUC) of Samsung Medical Center (SMC, 20210318001).

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