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Competing interests declaration

- ☒ We declare that none of the authors have competing financial or non-financial interests as defined by Nature Portfolio.
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Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.

- ☒ We confirm that the author list of this manuscript does not include any Large Language Models (LLMs).

Policy information about Authorship: inclusion & ethics in global research

All authors are encouraged to provide an "Inclusion & Ethics" statement where relevant.

- ☒ We have provided an "Inclusion & Ethics" statement.

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Data availability statement

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
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- ☒ We have provided a full data availability statement in the manuscript.

Mandated accession codes ([where applicable](#))

Confirm that all relevant data are deposited into a public repository and that accession codes are provided.

- ☒ All relevant accession codes are provided ☐ Accession codes will be available before publication ☐ No data with mandated deposition

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Code availability statement

For all studies using custom code or mathematical algorithm that is deemed central to the conclusions, the manuscript must include a statement under the heading "Code availability" describing how readers can access the code, including any access restrictions. Code availability statements should be provided as a separate section after the data availability statement but before the References.

☒ We have provided a full code availability statement in the manuscript

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For all data presented in a plot, chart or other visual representation confirm that:

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- ☐ ☒ Individual data points are shown when possible, and always for $n \leq 10$
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Additional policy considerations

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Does not apply

Involved in the study

- | | |
|-------------------------------------|---|
| ☒ | ☐ Macromolecular structural data |
| ☒ | ☐ Unique biological materials |
| ☒ | ☐ Research animals and/or animal-derived materials that require ethical approval |
| ☒ | ☐ Human embryos, gametes and/or stem cells |
| ☒ | ☐ Human research participants |
| ☒ | ☐ Clinical data |
| ☒ | ☐ Archaeological, geological, and palaeontological materials |

I certify that all the above information is complete and correct.

Typed signature Yadong Wang

Date Apr 29, 2025