

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

Data analysis

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 [the/all other] data supporting the findings of this study are available within the paper [and its supplementary information files].

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	Data was reported as sex
Reporting on race, ethnicity, or other socially relevant groupings	Race/ethnicity was not reported on in the publication - however given the distribution of ethnicity within South Australia - many of the men were of Caucasian descent.
Population characteristics	Recruited men from the public were generally healthy, aged between 18-50 years and who had not previously had a vasectomy/vasectomy reversal, or any condition that may affect their fertility (i.e. undescended testes, or genetic condition such as Klinefelter's syndrome).
Recruitment	Men from the general population were recruited through social media advertisements and fliers placed around the University of Adelaide
Ethics oversight	University of Adelaide Human Research Ethics Committee (H-2021-004, H-2024-006, H-2024-067).

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	Sample sizes were chosen based on our previous published studies in mice, humans and pigs.
Data exclusions	No data was excluded from analysis.
Replication	Or study outcomes were replicated multiple times. A within subject design was also utilized so all samples were exposed to all treatments for a given experiment.
Randomization	No randomization required as the study utilized a within subject design so all samples were exposed to all treatments in a given experiment.
Blinding	Blinding was not possible due to the nature of the 3D clinostat and removal of samples from equipment prior to 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	rabbit anti-Nanog (Cosmo Bio, Japan, Cat# REC-RCAB0002P-F, RRID:AB_10706358)
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Antibodies used	goat anti-Oct4 (Santa Cruz Biotechnology, Dallas, TX, USA, Cat# sc-8628, RRID:AB_653551) donkey anti-rabbit Alexa 488 (Life Technologies, Carlsbad, CA, USA, Cat# A-21206, RRID: AB_2535792) donkey anti-goat Alexa 594 (Life Technologies, Cat# A11058, RRID:AB_2534105)
Validation	All antibodies used in our studies have been previously utilized and published. McPherson NO, et al. Clinical use of progesterone in human sperm preparation media for increasing IVF success. Reprod Biomed Online 48, 103625 (2024).

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	Pre-pubertal (3–5-week-old) C57BL/6 x CBA (CBAF1) female mice were used for oocyte donors, and both CBAF1 and C57BL/6 male mice aged 3–6 months as sperm donors
Wild animals	Sow ovaries were collected from a local abattoir.
Reporting on sex	Sex of animals were included in manuscript
Field-collected samples	Sow ovaries were transported to the Adelaide Health and Medical Science Building (University of Adelaide) in warm (30–35°C) saline 0.9% NaCl solution.
Ethics oversight	All experiments using mice followed the Australian Code for the Care and Use of Animals for Scientific Purposes (2013). These were approved by the University of Adelaide Animal Ethics Committee (M-2023-005).

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

Plants

Seed stocks	N/A
Novel plant genotypes	N/A
Authentication	N/A