STEM CELL INNOVATION CONTEST 2026
11TH EDITION | THEME: STEM CELLS & AI
ID: 327
BIOBYTE
ĐƠN VỊ TỔ CHỨC
Waters
ĐƠN VỊ TÀI TRỢ

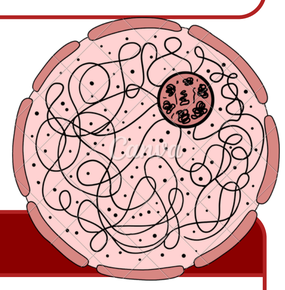
MECHANICAL-MEMORY PERSISTENCE IN MESENCHYMAL STROMAL CELLS: A FINAL EVIDENCE AND ESTIMAND AUDIT

PRIMARY RESEARCH QUESTION

Among published studies of MSCs exposed to a change in mechanical environment, which features of the initial stiffness and exposure schedule are associated with persistence of a measured cellular response after the mechanical condition changes?

OBJECTIVE

- Identify primary experimental studies that contain a defined priming phase, a post-switch or chase phase, and a measurable endpoint.
- Extract every eligible observation with a traceable locator and a verbatim source excerpt or explicit figure/table reference.



METHOD

Step 1: Literature Search and Source Identification

- Publisher pages, PubMed records, and open full-text repositories were consulted to verify bibliographic metadata and selected experimental details.

Step 2: Study Screening and Eligibility Assessment

- Identify primary experimental studies that contain a defined priming phase, a post-switch or chase phase, and a measurable endpoint.

Step 3: Data Extraction and Provenance

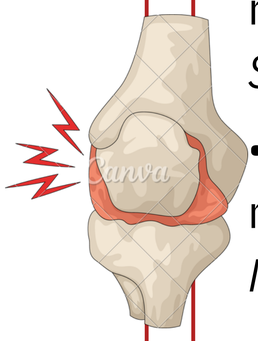
- The unit of extraction is one study × experimental condition x endpoint/readout × timepoint.

Step 4: Data Validation and Comparability Assessment

- The three rawX fields are required to reproduce independently; storing R alone is insufficient.

Step 5: Conditional Quantitative Analysis

- The analysis is conditional on the extraction meeting minimum requirements.



EXPECTED RESULTS

Working hypothesis

- Priming duration and stimulus intensity are associated with the persistence of the post-switch response.

F1 — Chase trend

- Within comparable conditions, the normalized response may decrease as chase time increases.

F2 — Priming trend

- Within comparable conditions, the normalized response may increase with priming duration.

CONCLUSION

- The verified literature contains directly relevant reports stiffness-switch experiments and history-dependent, readout-specific responses.
- The primary quantitative research question remains unanswered in this release because no row-level dataset has been validated in which the primed, soft-only, and stiff-only values are all recoverable at comparable total times.
- The defensible next phase is a separately tracked quantitative extension that must recover matched controls, archive the derivation of any reference inequality, and only then run the planned analyses.

REFERENCES

- Yang et al. (2014). Mechanical memory and dosing influence stem cell fate. *Nature Materials.*
- Killaars et al. (2019). Extended exposure to stiff microenvironments leads to persistent chromatin remodeling in human mesenchymal stem cells. *Advanced Science.*
- Li et al. (2017). MicroRNA-21 preserves the fibrotic mechanical memory of mesenchymal stem cells. *Nature Materials.*
- Price et al. (2021). Dynamic self-reinforcement of gene expression determines acquisition of cellular mechanical memory. *Biophysical Journal.*