Fabrication and evaluation of calcium polyphosphate-based graft materials for spinal fusion

*Vikas, Duby Okonkwo, Jonathan G. Schoenecker, Jason R McCarthy**

Masonic Medical Research Institute, Utica, New York, USA

Vanderbilt University, Nashville, Tennessee, USA

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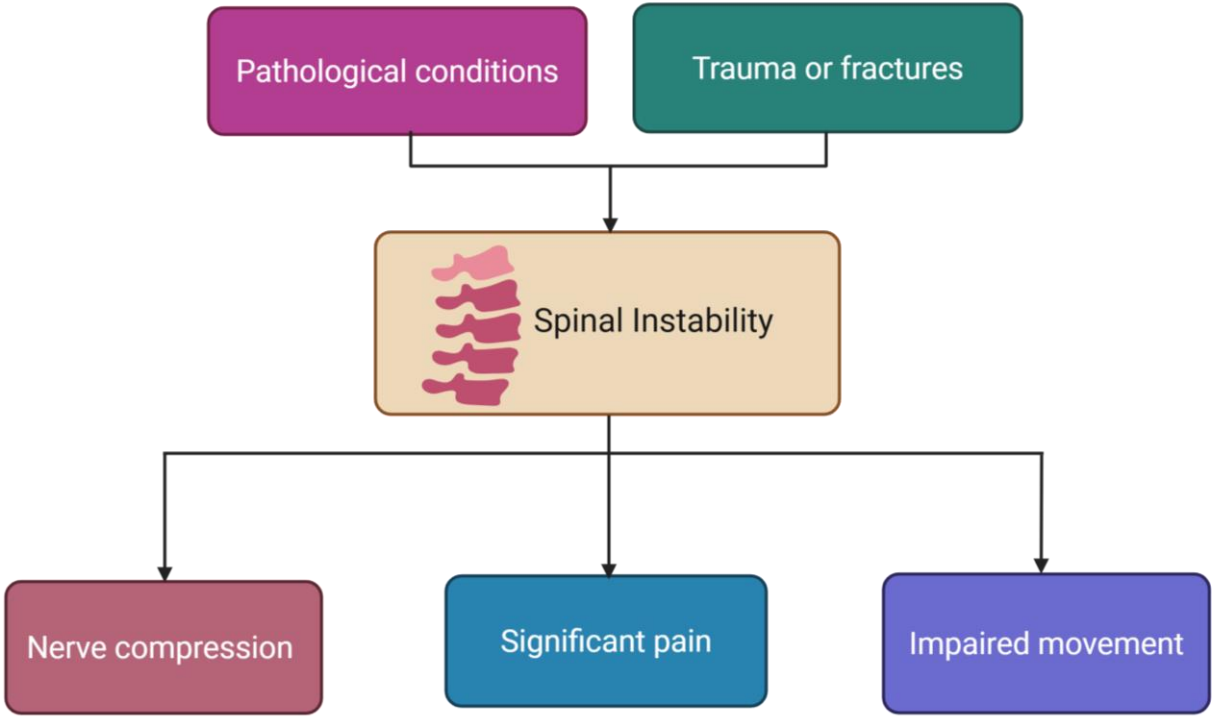
NEXT-GENERATION DELIVERY INNOVATIONS

Spinal instability



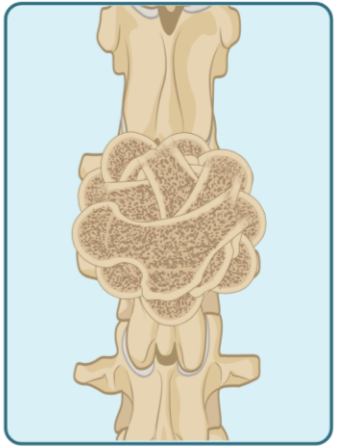
Spinal fusion

Spinal fusion

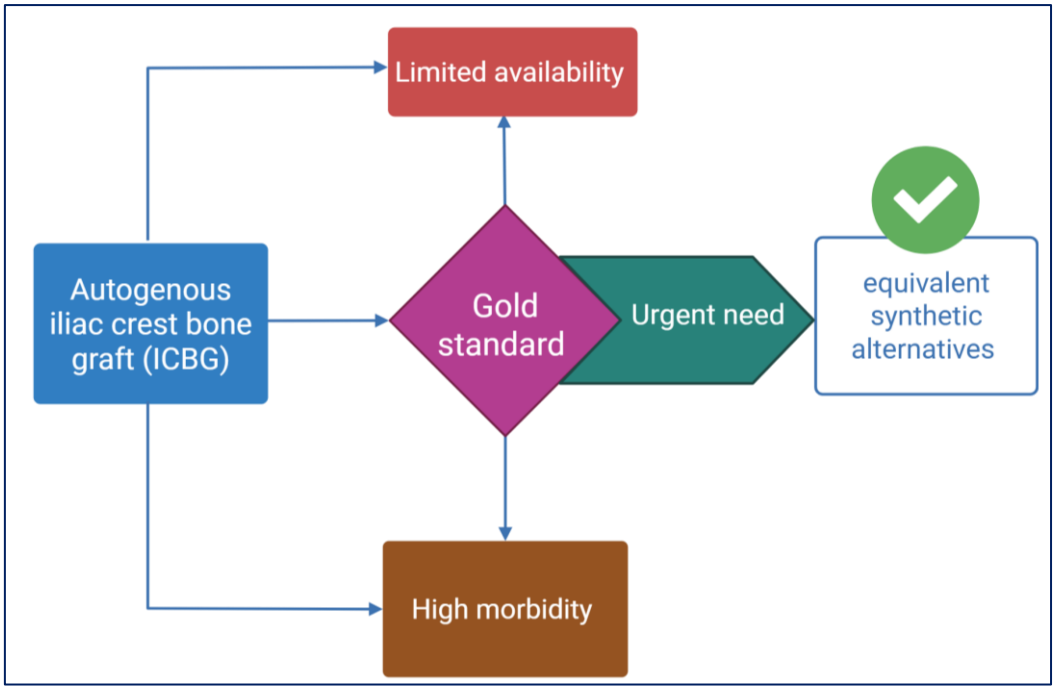
Surgical procedure used to permanently join vertebrae

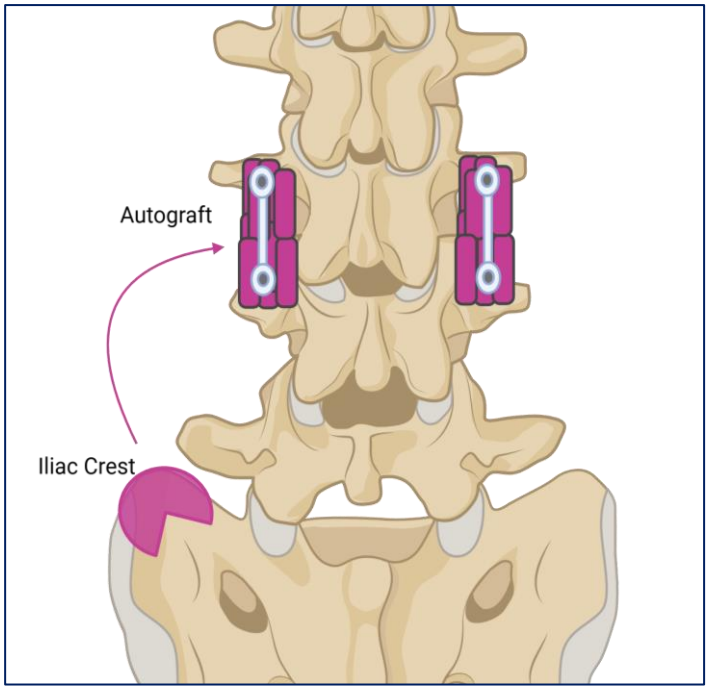
- Need revision surgery
- $41631 per surgery

High rate of Pseudoarthrosis



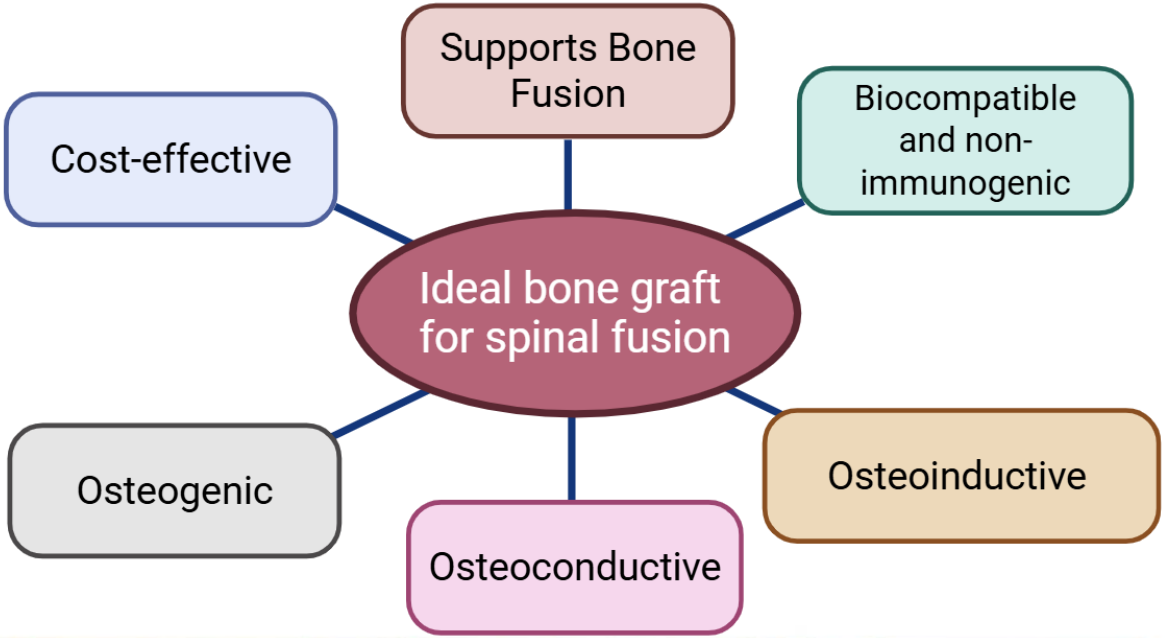
Autogenous iliac crest bone graft (ICBG)





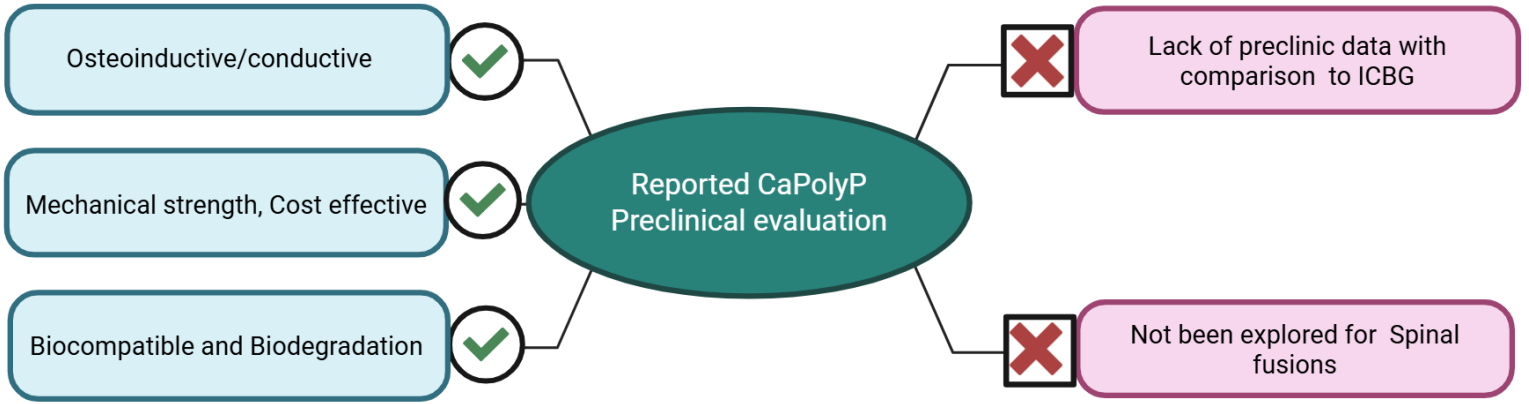
Ideal bone graft characterstics for spinal fusion

- Without the right graft properties, fusion may fail, leading to pseudoarthrosis.

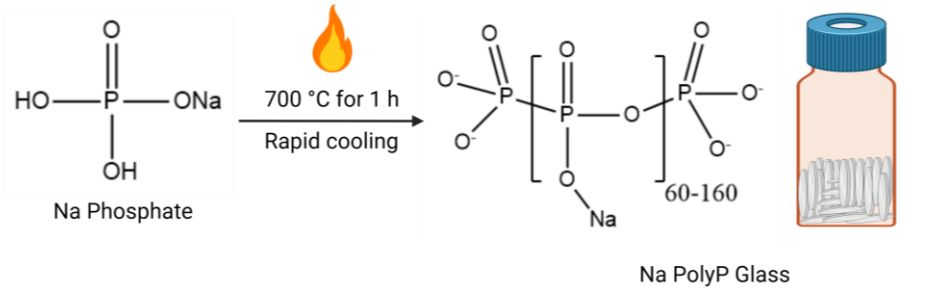


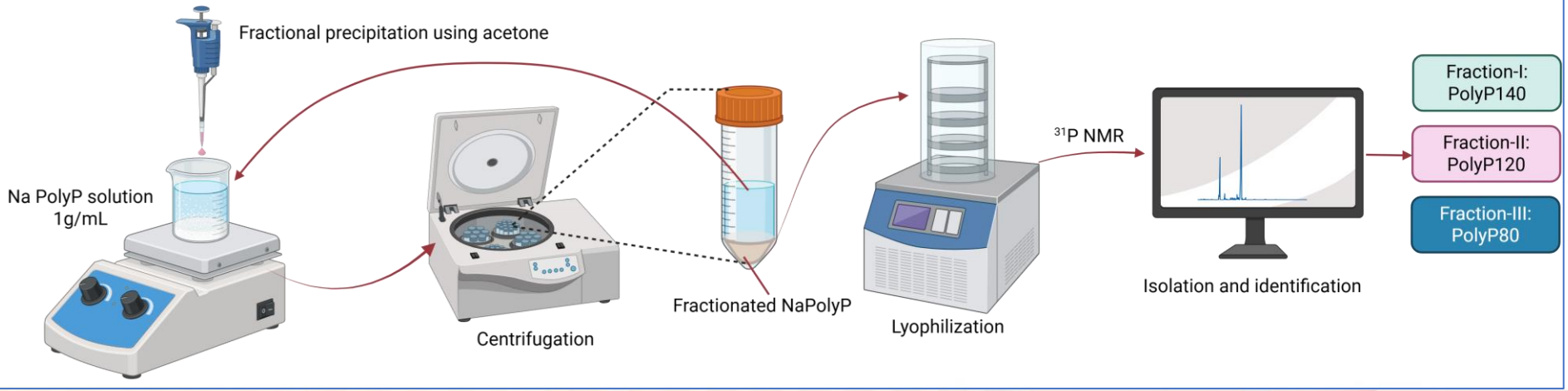
Study Objective

- *This study aimed to compare the performance of Ca-PolyP-NPs to autograft in promoting bone formation in a murine model of posterior lumbar spinal fusion.*

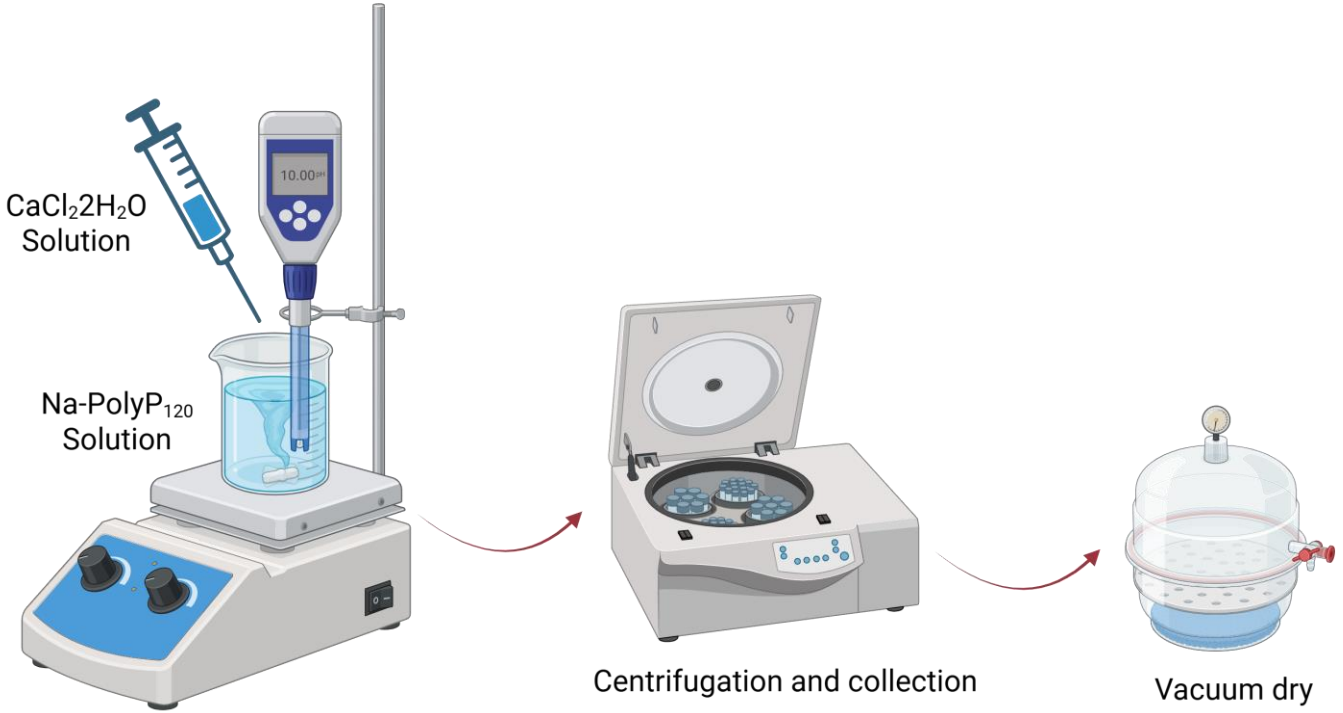


Cost effective synthesis of starting material for Ca-PolyP



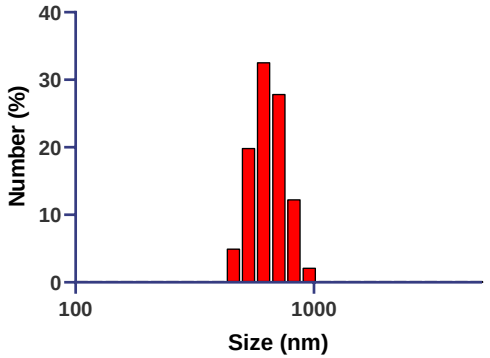


Ca-PP120-NPs Synthesis



Morphology of Ca-PP120-NPs

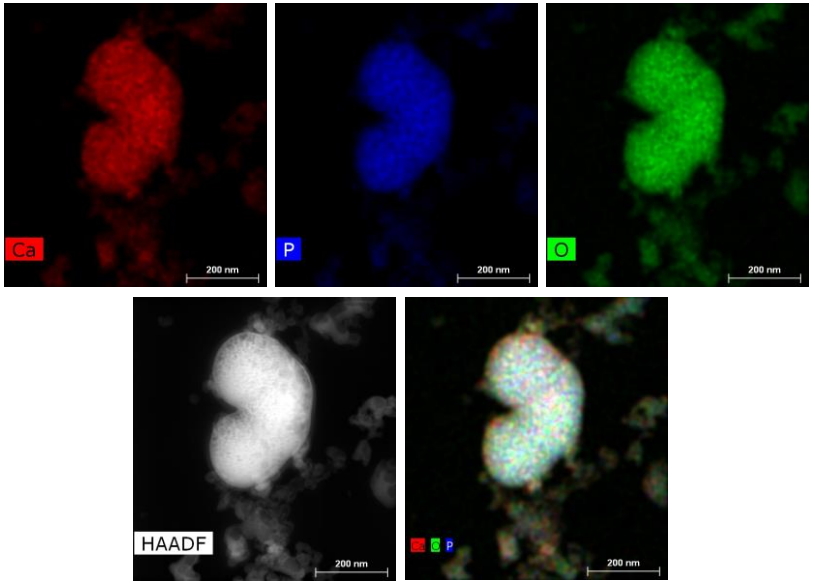
DLS Analysis



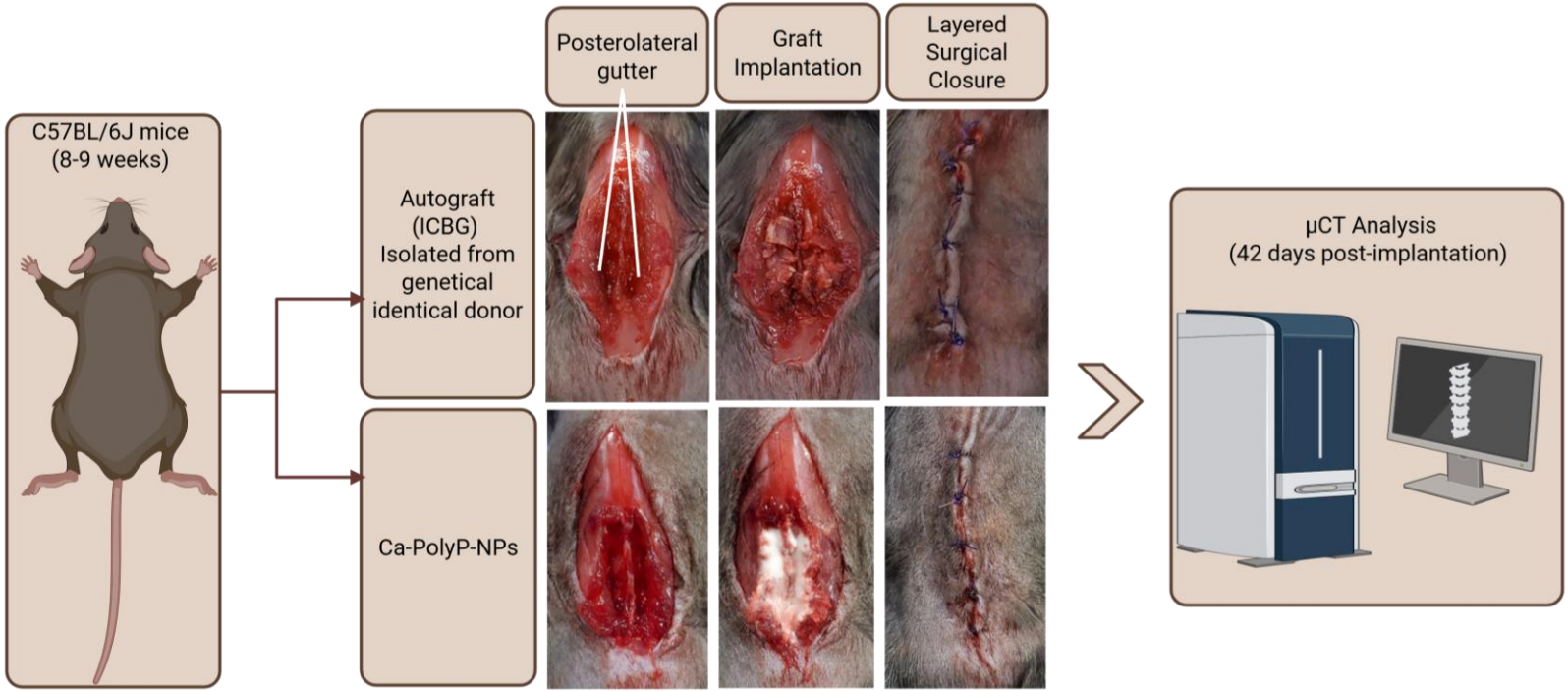
Particle size: 600.7 ± 52.95 nm

PDI: 0.717 ± 0.052

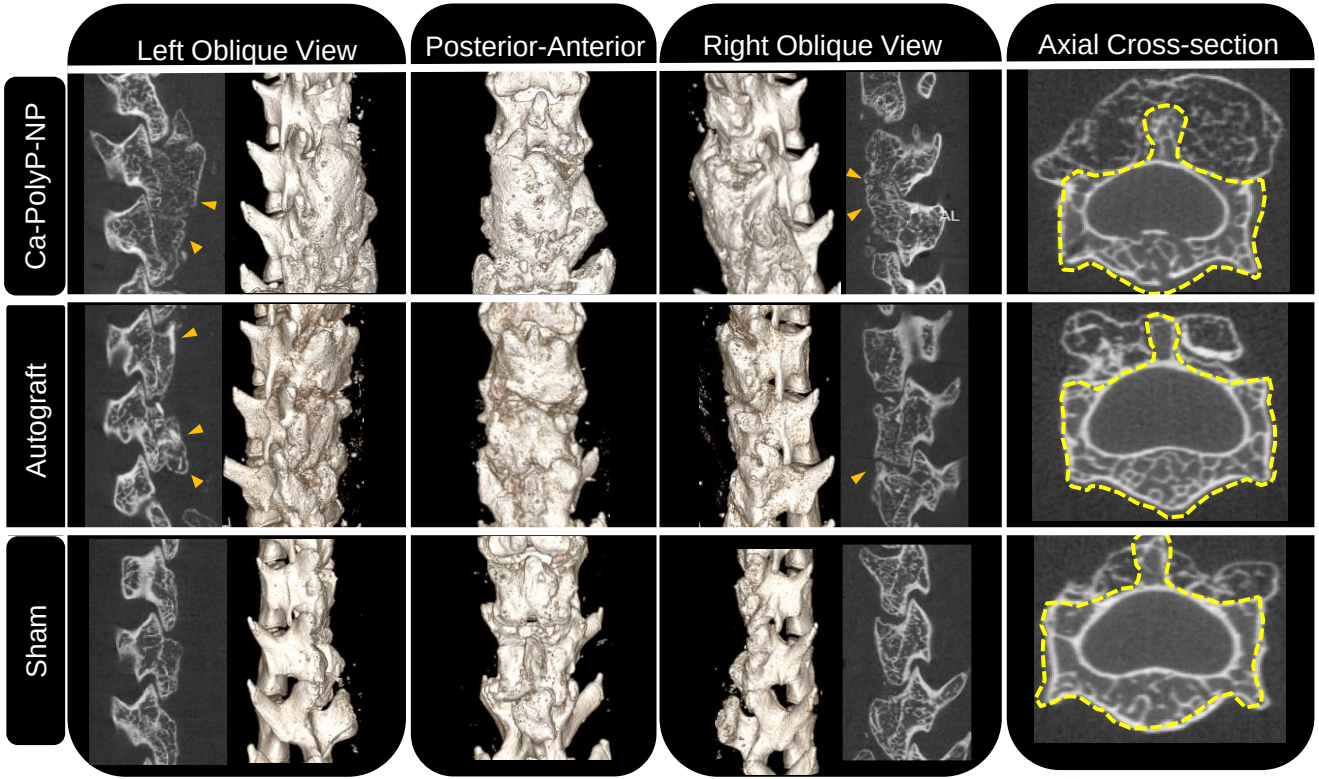
TEM Elemental mapping analysis

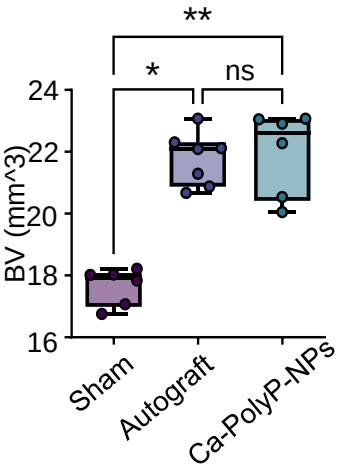


Posterior lumbar spinal fusion model

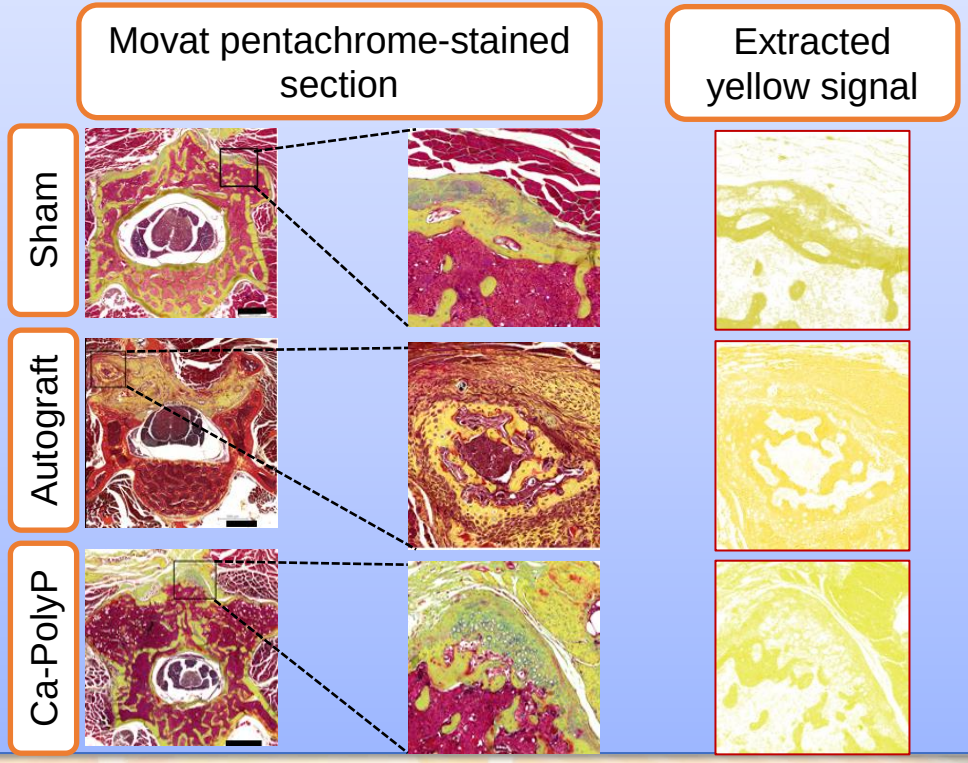


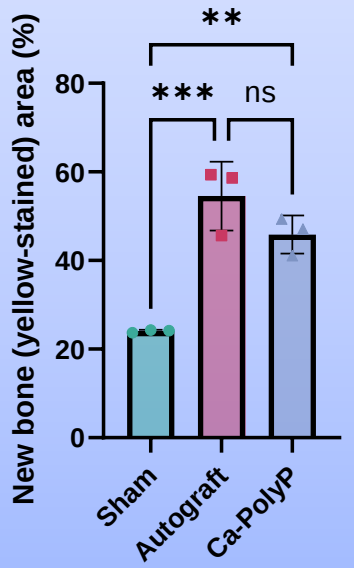
Ca-PolyP-NPs drives bone formation in posterolateral spine



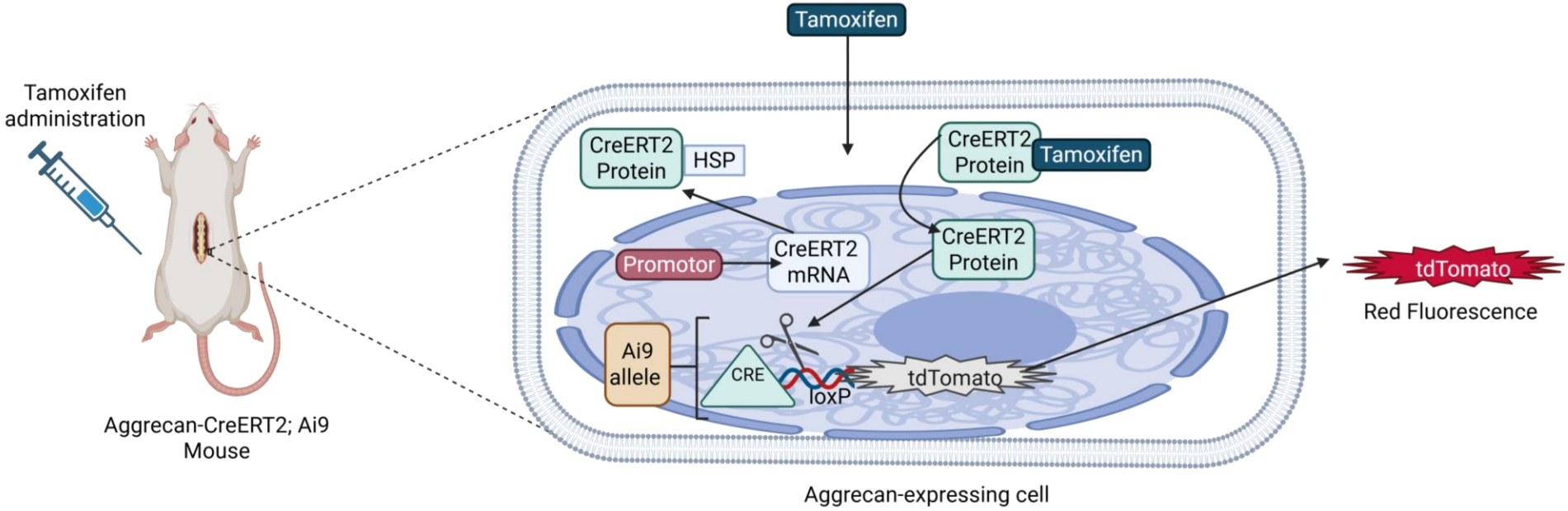


Ca-PolyP-NPs demonstrates equivalent spinal fusion potential to autograft





Aggrecan-CreERT2;Ai9 Model

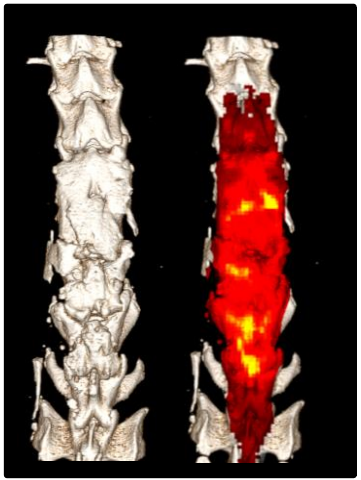


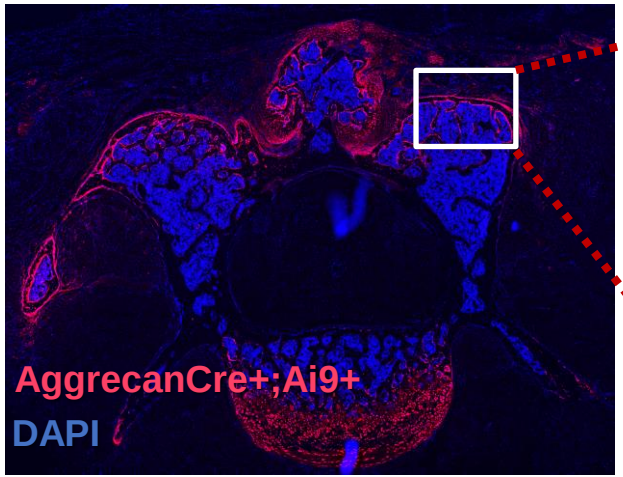
Ca-PolyP-NPs promotes bone formation via endochondral ossification

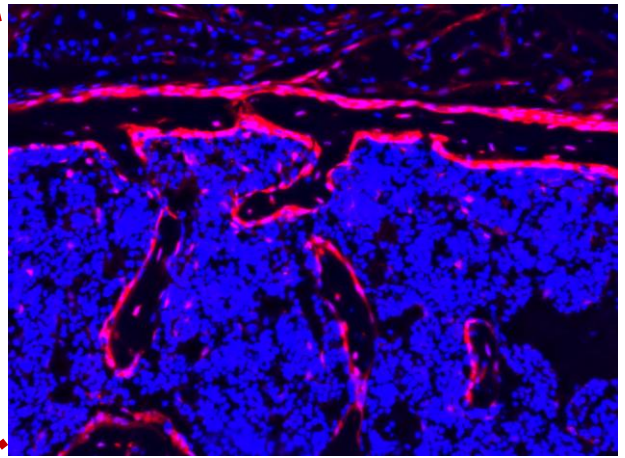
IVIS/µCT overlay

Fluorescence microscopy of tdTomato-expressing cells

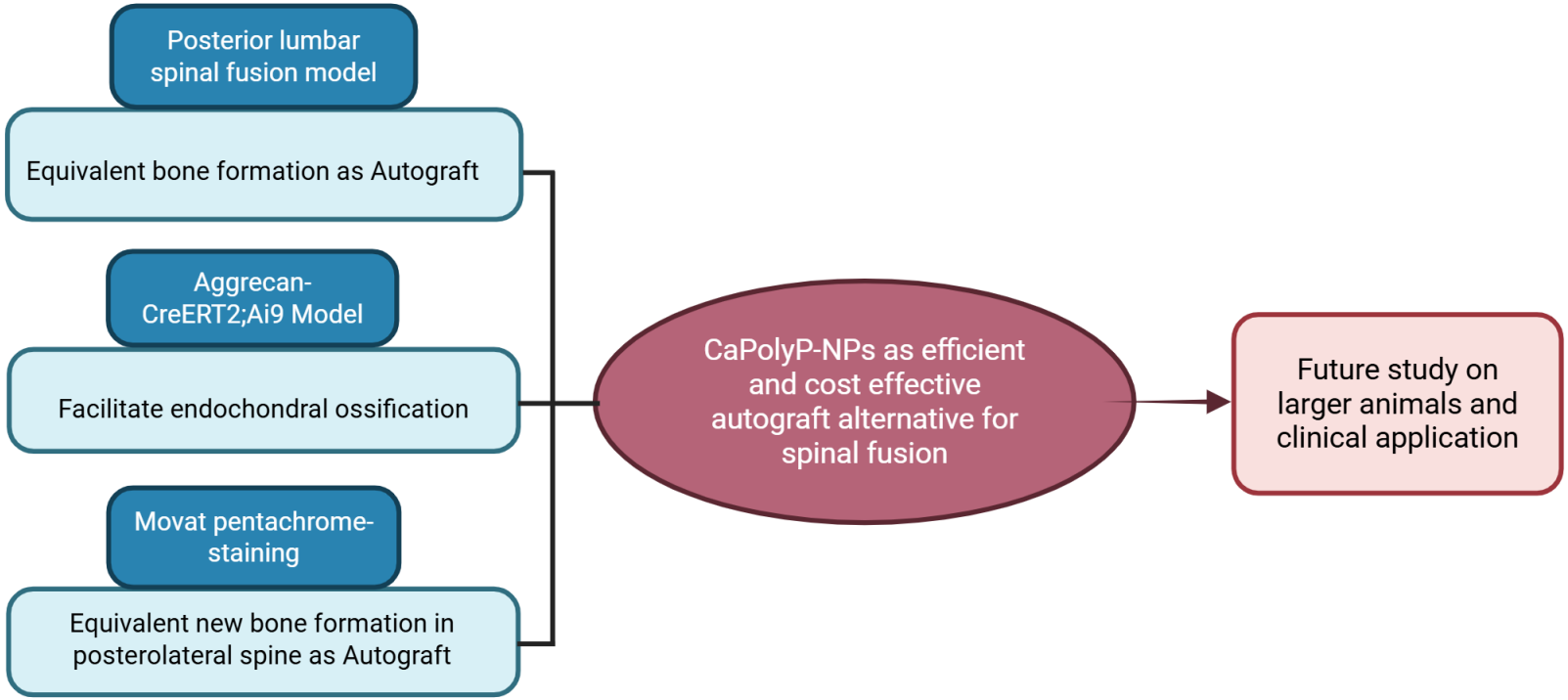
Aggrecan Cre+/Ai9+ with Ca-polyP-NPs







Conclusion


Posterior lumbar spinal fusion model
Equivalent bone formation as Autograft
Aggrecan-CreERT2;Ai9 Model
Facilitate endochondral ossification
Movat pentachrome-staining
Equivalent new bone formation in posterolateral spine as Autograft
CaPolyP-NPs as efficient and cost effective autograft alternative for spinal fusion
Future study on larger animals and clinical application

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? Any Questions

Thank you for your attention