AIC: A Novel Therapeutic Approach for Reversing Osteoporosis

Efficacy in restoring bone mineral density and suppressing osteoclast differentiation in OVX-induced models

Yena Oh • Sohee Moon • Paul K. Lee • Alex J. Lee • Jae H. Lee
Donghoon Yoon • Jong Park • and Jae Youl Cho

Methodology: Rigorous Evaluation via the OVX Model

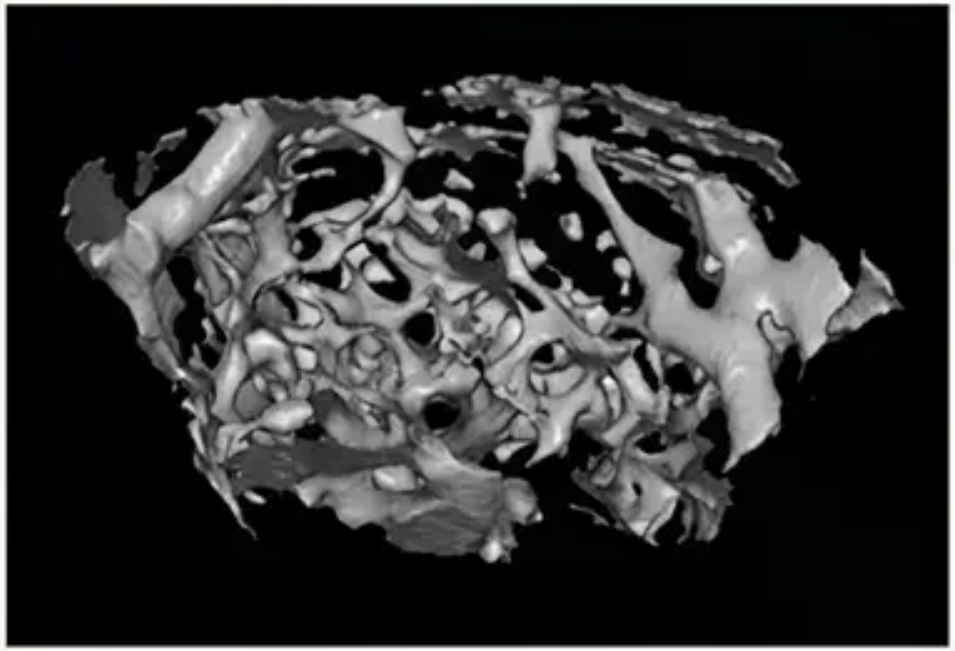
To simulate post-menopausal osteoporosis, mice underwent Ovariectomy (OVX). Following a 3-week surgical recovery, subjects received daily oral administration of AIC for 13 weeks to evaluate therapeutic efficacy.

Study Groups: 1. SHAM + Water (Healthy Control) | 2. OVX + Water (Disease Control) 3. OVX + AIC 100 mg/kg | 4. OVX + AIC 200 mg/kg

AIC Visibly Restores Trabecular Bone Microarchitecture

Micro-CT imaging reveals a stark recovery. The OVX group exhibits severe bone loss, while AIC-treated groups retain dense structure comparable to healthy baseline.

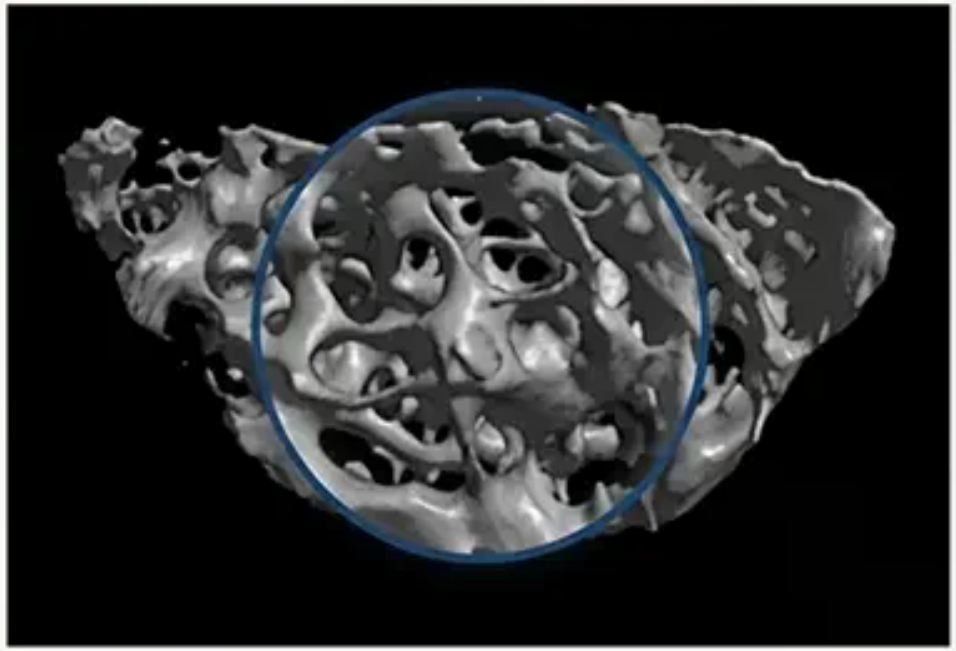
OVX Control (Osteoporosis Model)



Severe loss of trabecular connectivity.

13 Weeks Treatment →

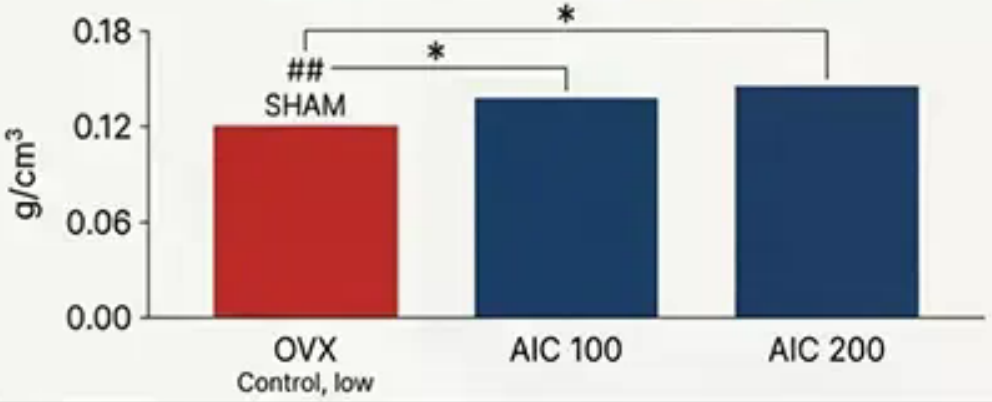
AIC 200 mg/kg (Treatment)

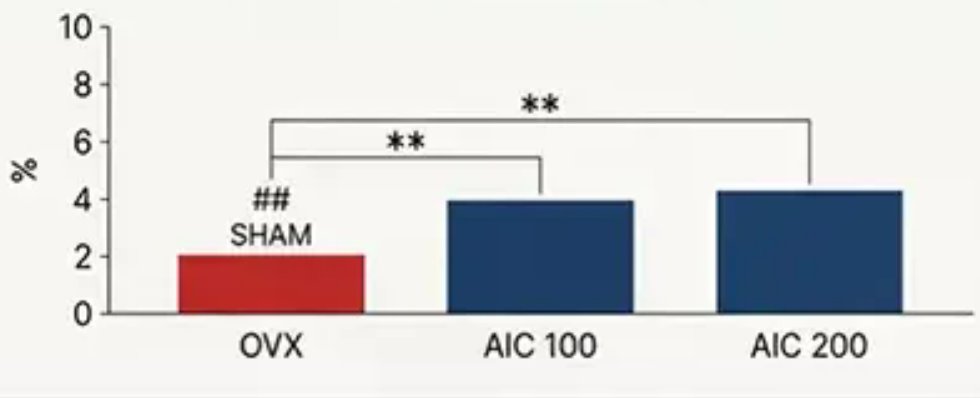


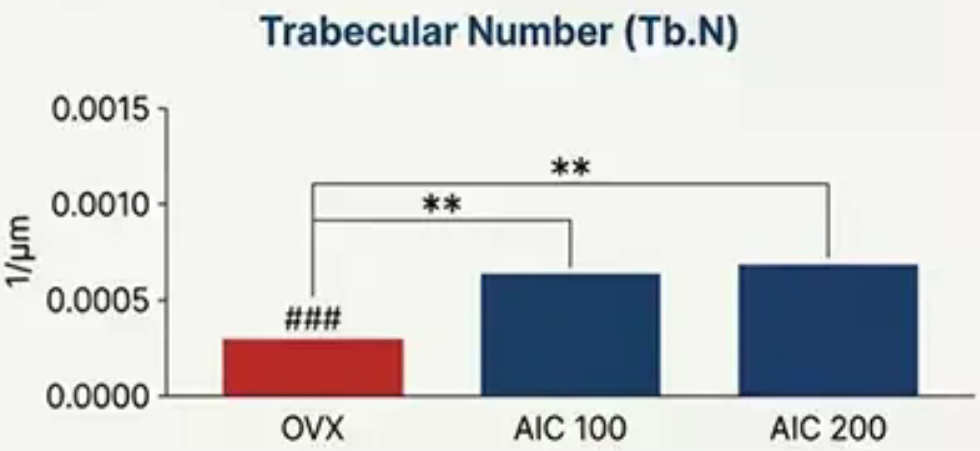
Restored bone density and microarchitecture.

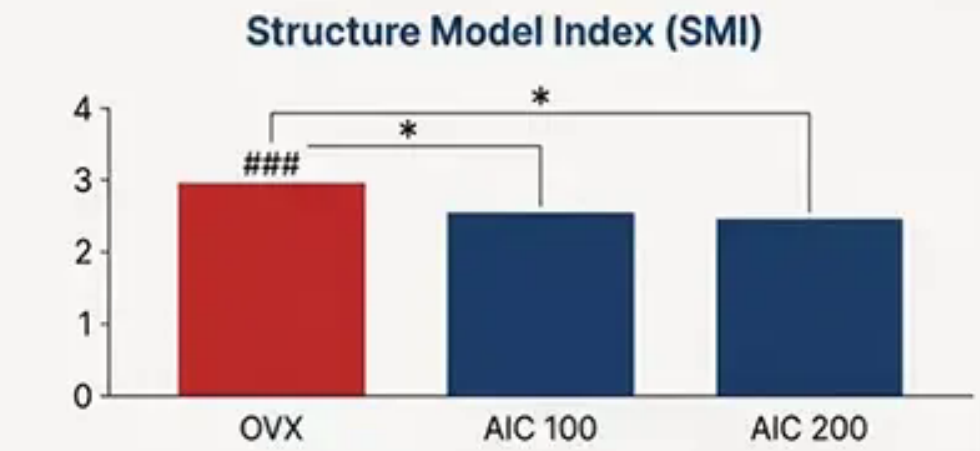
Significant Statistical Improvement in Bone Mineral Density

AIC treatment dose-dependently recovered critical bone health metrics, reversing structural damage caused by estrogen deficiency.





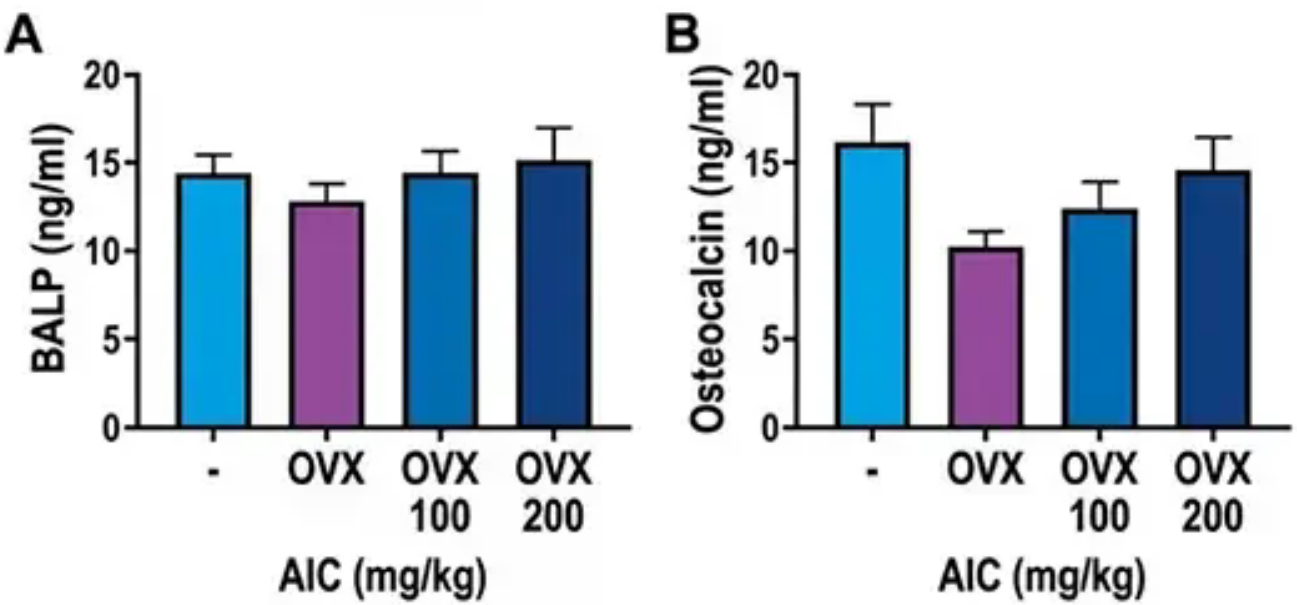




Regulating Bone Turnover at the Systemic Level

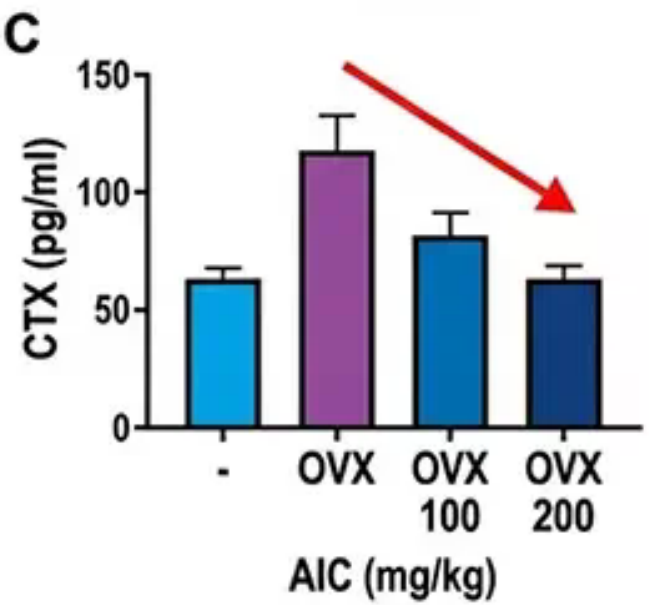
Biochemical analysis of serum shows that AIC rebalances the remodeling cycle: maintaining formation while suppressing resorption

Bone Formation (Maintained)



Osteoblast activity is preserved.

Bone Resorption (Suppressed)



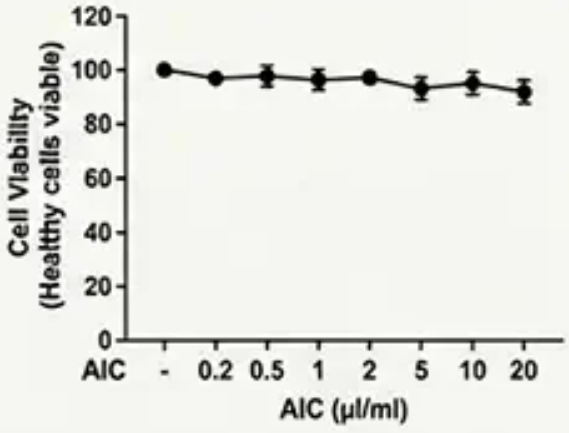
Significant inhibition of bone breakdown

Targeting the Genetic Drivers of Bone Loss

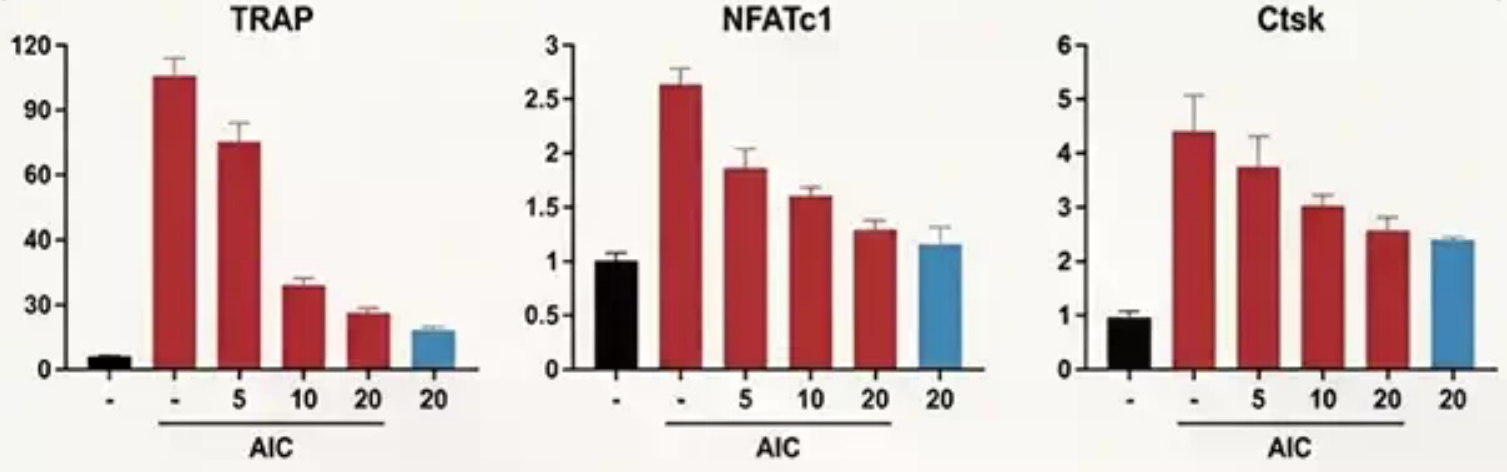
AIC acts as a genetic brake, down-regulating specific genes required for osteoclast differentiation.

RANKL Stimulation

Cell Viability
(Healthy cells remain viable)



Osteoclastogenic Gene Expression

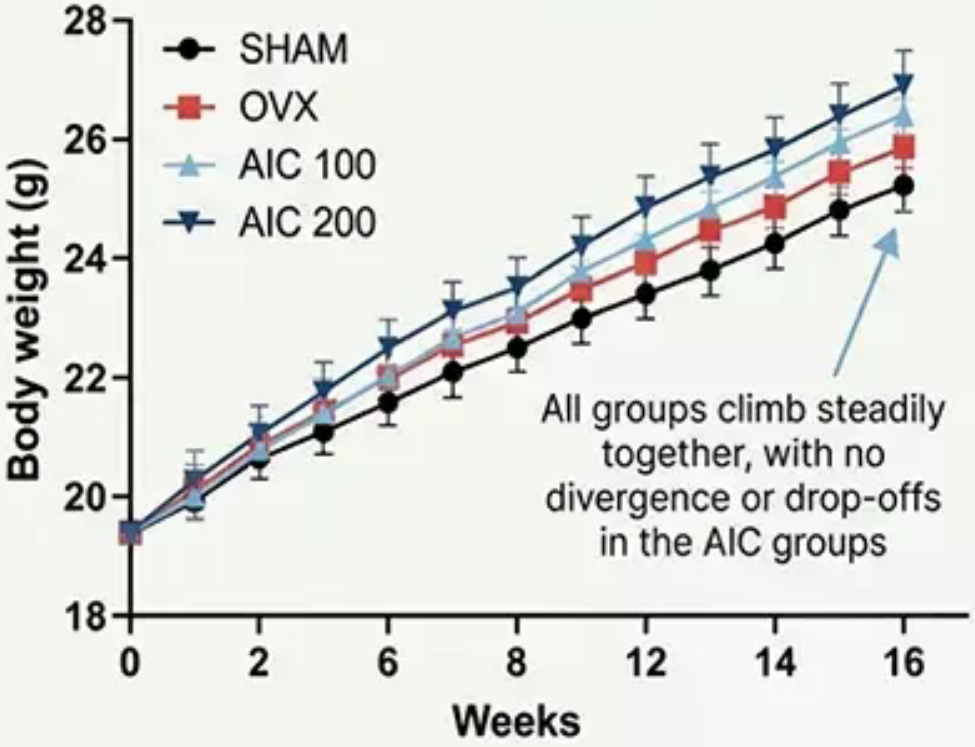


Suppression of Osteoclast Differentiation

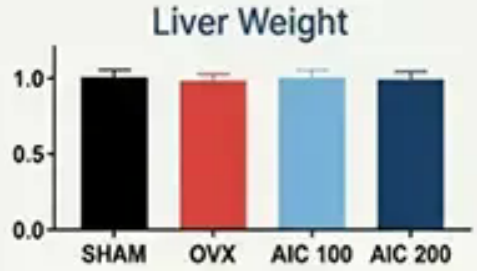
High Therapeutic Efficacy with a Clean Safety Profile

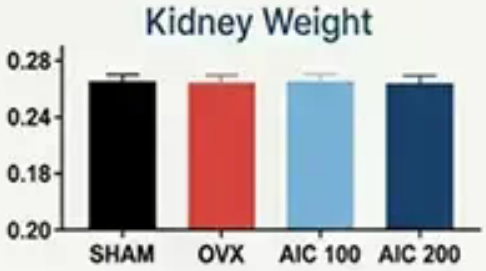
AIC administration resulted in no adverse effects on **general health**, body weight, or organ integrity over the 13-week period.

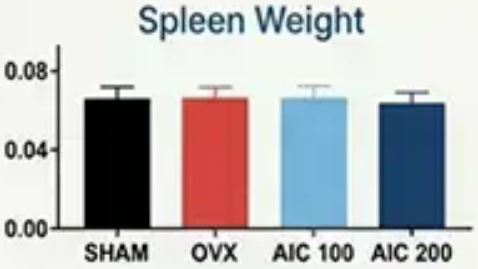
Body Weight



Organ Weights







Conclusion: No observable toxicity or pathological changes in major organs.

Conclusion: A Promising Candidate for Osteoporosis Treatment

AIC demonstrates a powerful dual-mechanism: physically restoring trabecular bone microarchitecture while biologically suppressing the genetic drivers of bone resorption.

- **Restored Bone Density:** Reverses bone loss in OVX models.
- **Improved Structure:** Increases trabecular number and volume.
- **Genetic Regulation:** Inhibits NFATc1 and osteoclast genes.
- **Verified Safety:** Non-toxic to major organs with healthy weight maintenance.

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