Effects of Parathyroid Hormone Treatment on Bone Mass of the Mouse Tibia

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What is Osteoporosis?

• Degenerative bone disease
• Mainly affects post-menopausal women
• Decrease in estrogen levels leads to decrease in bone mass
• Increased frequency in bone fractures

1: https://thebiotechnologist.ca/osteoporosis-life-sentence/
Osteoporosis Treatment

- Parathyroid hormone (PTH) treatments counter the degenerative effects of osteoporosis by improving bone mass and architecture.
- Stimulates cortical and trabecular bone growth in humans and animals.\(^1\)

1: Morley et. al., 2: Yi et. al.
Osteoporosis Treatment

• Mechanical loading, an anabolic stimulus, is also used to counter decreasing bone mass.

• Loading treatments in humans take form of exercise.
Combining Treatments

• When used together, PTH and mechanical loading are thought to have a synergistic effect.

• Studies are being conducted to explore possible optimization of combined treatment.

• This study focuses on the effect of PTH pre-treatments on the overall efficiency of loading.
Experimental Design and Methods

- Two genotypes:
  - Normal bone mass (LC)
  - Low bone mass (ERαKO)
- Baseline group euthanized following pre-treatment (no loading)
- Loaded group euthanized following pre-treatment plus 2 weeks loading.
Sample Analysis

• Analyzed cortical bone of 20 mice at midshaft using MicroCT.

• Parameters measured:
  • cortical area
  • cortical thickness
  • maximum/minimum moment of inertia
  • marrow area
  • tissue mineral density
Marrow and Cortical Area

**Marrow Area (mm²)**

- Normal Bone Mass
- Low Bone Mass

**Cortical Area (mm²)**

- Normal Bone Mass
- Low Bone Mass
Cortical Thickness

![Graph showing cortical thickness measurements for different conditions and bone mass categories.](image-url)
Minimum and Maximum Moment of Inertia

![Graph showing minimum and maximum moment of inertia for normal and low bone mass treated with VEH and PTH.](image)
Tissue Mineral Density

![Graphs showing tissue mineral density for normal and low bone mass under VEH and PTH conditions.](image-url)
• PTH tended to increase bone mass in normal bone mass mice but not low bone mass mice.
• Results may change with larger sample size.
• Loading with PTH treatment may have a more dramatic effect on bone mass.

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