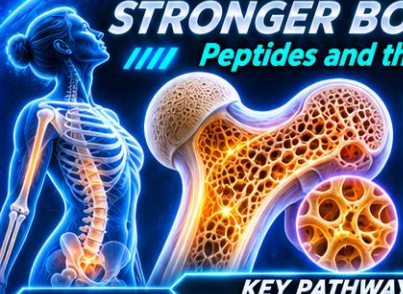
Peptide Perspectives™

STRONGER BONES, HEALTHIER AGING

Peptides and the Science of Bone Regeneration



LIVING BONE REMODELS CONTINUOUSLY

- **Osteoblasts – BUILD bone** (create new bone tissue).
- **Osteoclasts – RESORB bone** (break down old bone).
- **Osteocytes – SENSE load** (coordinate remodeling and strength).



- Bone quality (structure and material strength) matters as much as bone density (BMD) for fracture risk.

KEY PATHWAYS IN BONE HEALTH & REPAIR

PTH / PTHrP PATHWAY



- Intermittent PTH1 signaling stimulates bone formation.
- Basis for teriparatide and abaloparatide (FDA-approved).

WNT / SCLEROSTIN PATHWAY



- Wnt signaling drives bone building.
- Sclerostin is a brake on bone formation; blocking it (e.g., romosozumab) increases bone mass.

GH / IGF-1 PATHWAY



- GH increases IGF-1, which can stimulate bone formation in research.
- Peptides like ipamorelin, CJC-1295, and IGF-1 are under investigation (limited human data).

FRACTURE-HEALING PROCESS



- Inflammation (days): clears damage, recruits repair cells.
- Soft callus (weeks): new, flexible tissue.
- Hard callus (weeks–months): mineralization and structural strength.
- Remodeling (months): restores normal bone.

EIGHT KEY COMPOUNDS & THE EVIDENCE

TERIPARATIDE



- FDA-approved peptide (PTH 1–34).
- Increases bone formation and reduces fractures in selected high-risk osteoporosis patients.

ABALOPARATIDE



- FDA-approved peptide (PTHrP analog).
- Increases bone formation and reduces fracture risk in postmenopausal women with osteoporosis.

ROMOSOZUMAB



- FDA-approved monoclonal antibody (NOT a short peptide).
- Increases bone formation and decreases bone resorption.
- Reduces fracture risk, but carries a cardiovascular warning (avoid in higher-risk patients).

BPC-157



- Experimental peptide.
- Shows bone and tendon healing in animal orthopedic models.
- No controlled human trials demonstrating bone density or fracture benefit.

IPAMORELIN



- Growth hormone secretagogue (GHS).
- Animal studies suggest increased bone formation and bone mass.
- Not proven to prevent fractures in humans.

CJC-1295



- Long-acting GHRH analog (± DAC).
- Can increase GH and IGF-1 in humans.
- No demonstrated benefit for fracture healing or osteoporosis outcomes.

IGF-1 LR3 / DES



- Modified IGF-1 analogues with longer activity.
- Show bone anabolic effects in animal studies.
- Unvalidated for osteoporosis or fracture prevention; potential risk of hypoglycemia and other side effects.

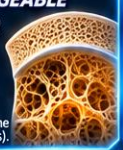
ORAL COLLAGEN PEPTIDES



- Bioactive collagen peptides (e.g., type I/II).
- Small human studies suggest modest gains in bone density and bone markers.
- Not proven to prevent fractures.

THREE OUTCOMES ARE NOT INTERCHANGEABLE

- Higher BMD (more bone mass) does not always mean a lower fracture risk.
- Healing a fracture (repairing injury) is different from building bone in osteoporosis.
- Fewer future fractures is the most important clinical outcome (and requires long-term studies).



WHAT ROBUST TRIALS MEASURE



- DXA bone mineral density (BMD) changes.
- Incident fractures (especially vertebral and hip).
- Fracture union and time to heal (for acute injuries).
- Walking ability and return to daily function.
- Long-term safety (e.g., cardiovascular, cancer, other risks).

THE RESEARCH HORIZON



- Optimal sequencing (e.g., build bone first, then antiresorptives).
- Local peptide delivery (e.g., at fracture or surgical sites).
- Better human trials for fracture repair and orthopedic recovery.
- Personalized screening (genetics, hormones, age, and fracture risk).

EVIDENCE-BASED FOUNDATIONS FOR STRONGER BONES



Resistance & weight-bearing exercise
(builds and maintains bone strength).



Sufficient protein
(≈ 1.2–1.6 g/kg/day or per clinical guidance).



Adequate calcium
(≈ 1,000–1,200 mg/day from diet and/or supplement).



Vitamin D
(often 1,000–2,000 IU/day or as needed to reach healthy blood levels).



Fall prevention
(balance, strength, vision, home safety).



Appropriate DXA screening
(based on age, risk factors, and clinical guidelines).

EXPERIMENTAL PEPTIDES ARE NOT PROVEN OSTEOPOROSIS OR FRACTURE TREATMENTS. HUMAN FRACTURE OUTCOMES MATTER.

Educational research overview | November 2026 | Not medical advice