

**THE EVIDENCE FOR P-15 OSTEOGENIC CELL BINDING PEPTIDE**  
**The safe biological way to activate bone growth**



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ML-0045 11/20



# MECHANISM OF ACTION

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT™ IS BOUND TO THE ANORGANIC BONE MATRIX AND ENSURES BONE GROWS WHERE YOU WANT IT.

- Hole BB, Schwarz JA, Gilbert JL, Atkinson BL. A study of biologically active peptide sequences (P-15) on the surface of an ABM scaffold (PepGen P-15) using AFM and FTIR. *J Biomed Mater Res A*. 2005 Sep 15;74(4):712-21.
- Qian JJ, Bhatnagar RS. Enhanced cell attachment to anorganic bone mineral in the presence of a synthetic peptide related to collagen. *J Biomed Mater Res*. 1996 Aug;31(4):545-54.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT INCREASES THE NUMBER OF VIABLE OSTEOGENIC CELLS ATTACHED.

- Qian JJ, Bhatnagar RS. Enhanced cell attachment to anorganic bone mineral in the presence of a synthetic peptide related to collagen. *J Biomed Mater Res*. 1996 Aug;31(4):545-54.
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- Turhani D, Item C, Thurnher D, Kapral D, Cvikl B, Weissenböck M, Yerit K, Erovic B, Moser D, Watzinger F, Ewers R, Lauer G. [Evidence of osteocalcin expression in osteoblast cells of mandibular origin growing on biomaterials with RT-PCR and SDS-PAGE/Western blotting]. *Mund Kiefer Gesichtschir*. 2003 Sep;7(5):294-300. Epub 2003 Sep 12. German.
- Bhatnagar RS, Qian JJ, Wedrychowska A, Sadeghi M, Wu YM, Smith N. Design of biomimetic habitats for tissue engineering with P-15, a synthetic peptide analogue of collagen. *Tissue Eng*. 1999 Feb;5(1):53-65.
- Yuan K, Huang JS, Hsu CW, Hung IJ. A mineralization-associated membrane protein plays a role in the biological functions of the peptide-coated bovine hydroxyapatite. *J Periodontal Res*. 2007 Oct;42(5):420-8.
- Mittal A, Negi P, Garkhal K, Verma S, Kumar N. Integration of porosity and bio-functionalization to form a 3D scaffold: cell culture studies and in vitro degradation. *Biomed Mater*. 2010 Aug;5(4):045001.
- Liu Q, Limthongkul W, Sidhu G, Zhang J, Vaccaro A, Shenck R, Hickok N, Shapirol, Freeman T. Covalent attachment of P-15 peptide to titanium surfaces enhances cell attachment, spreading, and osteogenic gene expression. *J Orthop Res*. 2012 Oct;30(10):1626-33.
- Pereira KKY, Oliveira FS, Alves OC, Novaes Junior AB, Nanci A, Rosa AL, De Oliveira PT. Development of the osteogenic phenotype in vitro on titanium surface microtopography functionalized with a type I collagen-derived synthetic peptide. *Bone* (2012) 50 Suppl. 1 (S68). May 2012

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT CAUSES STEM CELL DIFFERENTIATION TO VIABLE OSTEOGENIC CELLS.

- Turhani D, Weissenböck M, Watzinger E, Yerit K, Cvikl B, Ewers R, Thurnher D. In vitro study of adherent mandibular osteoblast-like cells on carrier materials. *Int J Oral Maxillofac Surg*. 2005 Jul;34(5):543-50. Epub 2005 Jan 26.
- Hennessy KM, Pollot BE, Clem WC, Phipps MC, Sawyer AA, Culpepper BK, Bellis SL. The effect of collagen I mimetic peptides on mesenchymal stem cell adhesion and differentiation, and on bone formation at hydroxyapatite surfaces. *Biomaterials*. 2009 Apr;30(10):1898-909.
- Yang XB, Bhatnagar RS, Li S, Oreffo RO. Biomimetic collagen scaffolds for human bone cell growth and differentiation. *Tissue Eng*. 2004 Jul-Aug;10(7-8):1148-59.
- Lauritano D, Carinci F, Zollino I, Hassanipour A, Saggese V, Palmieri A, Girardi A, Cura F, Piras A, Zamboni P, Brunelli G. P15 induces RUNX2 in bone marrow derived stem cells. *European Journal of Inflammation* (2012) 10:1 Supplement 3 (95-100). 2012.
- Sollazzo V, Palmieri A, Girardi A, Farinella F, Carinci F. Early effects of p-15 on human bone marrow stem cells. *J Oral Maxillofac Res*. 2010 Apr 1;1(1):e4.
- Mohanram Y, Zhang J, Tsiridis E, Yang XB. Comparing bone tissue engineering efficacy of HDPSCs, HBMSCs on 3D biomimetic ABM-P-15 scaffolds in vitro and in vivo. *Cytotechnology*. 2020 Oct 72(5):715-730.

# MECHANISM OF ACTION

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN INCREASED EXPRESSION OF ALKALINE PHOSPHATASE (AN IMPORTANT ENZYME IN THE MINERALIZATION PROCESS) LEADING TO EARLY BONE FORMATION.

- Nguyen H, Qian JJ, Bhatnagar RS, Li S. Enhanced cell attachment and osteoblastic activity by P-15 peptide-coated matrix in hydrogels. *Biochem Biophys Res Commun*. 2003 Nov 7;311(1):179-86.
- Yang XB, Bhatnagar RS, Li S, Oreffo RO. Biomimetic collagen scaffolds for human bone cell growth and differentiation. *Tissue Eng*. 2004 Jul-Aug;10(7-8):1148-59.
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- Mohanram Y, Zhang J, Tsiridis E, Yang XB. Comparing bone tissue engineering efficacy of HDPSCs, HBMSCs on 3D biomimetic ABM-P-15 scaffolds in vitro and in vivo. *Cytotechnology*. 2020 Oct 72(5):715-730.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN INCREASED EXPRESSION OF BONE MORPHOGENIC PROTEIN (BMP) LEADING TO EARLY BONE FORMATION.

- Nguyen H, Qian JJ, Bhatnagar RS, Li S. Enhanced cell attachment and osteoblastic activity by P-15 peptide-coated matrix in hydrogels. *Biochem Biophys Res Commun*. 2003 Nov 7;311(1):179-86.
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- Emecen P, Akman AC, Hakki SS, Hakki EE, Demiralp B, Tözüm TF, Nohutcu RM. ABM/P-15 modulates proliferation and mRNA synthesis of growth factors of periodontal ligament cells. *Acta Odontol Scand*. 2009;67(2):65-73.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT IS ABLE TO UP- AND DOWN-REGULATE SPECIFIC GENE EXPRESSION RELATING TO CELL CYCLE REGULATION, APOPTOSIS, STRUCTURAL PROTEIN AND SIGNALLING TRANSDUCTION.

- Carinci F, Pezzetti F, Volinia S, Laino G, Arcelli D, Caramelli E, Degidi M, Piattelli A. P-15 cell-binding domain derived from collagen: analysis of MG63 osteoblastic-cell response by means of a microarray technology. *J Periodontol*. 2004 Jan;75(1):66-83.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES THE IMMEDIATE AND PROLONGED EXPRESSION OF TGF-B1 GROWTH FACTOR AT SIGNIFICANTLY HIGHER LEVELS THAN HYDROXYAPATITE ALONE.

- Trasatti C, Spears R, Gutmann JL, Opperman LA. Increased Tgf-beta1 production by rat osteoblasts in the presence of PepGen P-15 in vitro. *J Endod*. 2004 Apr;30(4):213-7.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT INCREASES THE EXPRESSION OF TGF-B1 AND BMP-2 TO TO ENHANCED TISSUE REGENERATIVE CAPACITY.

- Emecen P, Akman AC, Hakki SS, Hakki EE, Demiralp B, Tözüm TF, Nohutcu RM. ABM/P-15 modulates proliferation and mRNA synthesis of growth factors of periodontal ligament cells. *Acta Odontol Scand*. 2009;67(2):65-73.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES THE EXPRESSION OF RUNX2 AND SP7 (IMPORTANT TRANSCRIPTION FACTORS INVOLVED IN OSTEOBLAST DIFFERENTIATION AND BONE FORMATION).

- Lauritano D, Carinci F, Zollino I, Hassanipour A, Saggese V, Palmieri A, Girardi A, Cura F, Piras A, Zamboni P, Brunelli G. P15 induces RUNX2 in bone marrow derived stem cells. *European Journal of Inflammation* (2012) 10:1 Supplement 3 (95-100). 2012.
- Liu Q, Limthongkul W, Sidhu G, Zhang J, Vaccaro A, Shenck R, Hickok N, Shapirol, Freeman T. Covalent attachment of P15 peptide to titanium surfaces enhances cell attachment, spreading, and osteogenic gene expression. *J Orthop Res*. 2012 Oct;30(10):1626-33.



## MECHANISM OF ACTION

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES THE EXPRESSION OF FOSL1 (INVOLVED IN THE REGULATION OF BONE-SPECIFIC GENE EXPRESSION RELATING TO OSTEOBLAST DIFFERENTIATION).

- Lauritano D, Carinci F, Zollino I, Hassanipour A, Saggese V, Palmieri A, Girardi A, Cura F, Piras A, Zamboni P, Brunelli G. P15 induces RUNX2 in bone marrow derived stem cells. *European Journal of Inflammation* (2012) 10:1 Supplement 3 (95-100). 2012.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES THE EXPRESSION OF SPP1 AND BGLAP (TWO GENES EXPRESSED BY OSTEOBLASTS DURING THEIR EARLY DIFFERENTIATION) IN BONE MARROW DERIVED MESENCHYMAL STEM CELLS.

- Lauritano D, Carinci F, Zollino I, Hassanipour A, Saggese V, Palmieri A, Girardi A, Cura F, Piras A, Zamboni P, Brunelli G. P15 induces RUNX2 in bone marrow derived stem cells. *European Journal of Inflammation* (2012) 10:1 Supplement 3 (95-100). 2012.
- Sollazzo V, Palmieri A, Girardi A, Farinella F, Carinci F. Early effects of p-15 on human bone marrow stem cells. *J Oral Maxillofac Res.* 2010 Apr 1;1(1):e4.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT MODULATES GENE EXPRESSION RELATING TO MULTIPLE EXTRACELLULAR MATRIX GENES INCLUDING COL1A1 AND COL3A1.

- Sollazzo V, Palmieri A, Girardi A, Farinella F, Carinci F. Early effects of p-15 on human bone marrow stem cells. *J Oral Maxillofac Res.* 2010 Apr 1;1(1):e4.
- Mohanram Y, Zhang J, Tsidis E, Yang XB. Comparing bone tissue engineering efficacy of HDPSCs, HBMSCs on 3D biomimetic ABM-P-15 scaffolds in vitro and in vivo. *Cytotechnology.* 2020 Oct 72(5):715-730.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT INFLUENCES MICRO-RNA EXPRESSION AND GENE EXPRESSION IN OSTEOBLAST-LIKE CELLS.

- Palmieri A, Pezzetti F, Brunelli G, Martinelli M, Lo Muzio L, Scarano A, Degidi M, Piattelli A, Carinci F. Peptide-15 changes miRNA expression in osteoblast-like cells. *Implant Dent.* 2008 Mar;17(1):100-8.
- Palmieri A, Pezzetti F, Brunelli G, Zollino I, Scapoli L, Martinelli M, Arlotti M, Carinci F. Differences in osteoblast miRNA induced by cell binding domain of collagen and silicate-based synthetic bone. *J Biomed Sci.* 2007 Nov;14(6):777-82. Epub 2007 Jul 25.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES MORE RAPID CYTOSKELETAL DEVELOPMENT COMPARED TO UNTREATED SUBSTRATES.

- Liu Q, Limthongkul W, Sidhu G, Zhang J, Vaccaro A, Shenck R, Hickok N, Shapirol, Freeman T. Covalent attachment of P15 peptide to titanium surfaces enhances cell attachment, spreading, and osteogenic gene expression. *J Orthop Res.* 2012 Oct;30(10):1626-33.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN HIGHER EXPRESSION OF ALKALINE PHOSPHATASE (AN EARLY MARKER OF CELL PROLIFERATION) COMPARED TO OTHER BONE GRAFT SUBSTITUTES.

- Kübler A, Neugebauer J, Oh JH, Scheer M, Zöller JE. Growth and proliferation of human osteoblasts on different bone graft substitutes: an in vitro study. *Implant Dentistry.* 2004 June: 13(2): 171-9.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ENHANCES BONE MARROW STROMAL CELL ATTACHMENT, SPREADING AND ALIGNMENT, AND THE PROVISION OF BIOMIMETIC MICROENVIRONMENTS FOR OSTEOBLASTS LEADING TO BONE FORMATION.

- Yang XB, Bhatnagar RS, Li S, Oreffo RO. Biomimetic collagen scaffolds for human bone cell growth and differentiation. *Tissue Eng.* 2004 Jul-Aug;10(7-8):1148-59.
- Thorwarth M, Schultze-Mosgau S, Wehrhan F, Kessler P, Srou S, Wiltfang J, Andreas Schlegel K. Bioactivation of an anorganic bone matrix by P-15 peptide for the promotion of early bone formation. *Biomaterials.* 2005 Oct;26(28):5648-57. Epub 2005 Apr 18.

## MECHANISM OF ACTION

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES EARLY BONE FORMATION AT A SIGNIFICANTLY HIGHER RATE COMPARED TO NON-TREATED ANORGANIC BONE (HYDROXYAPATITE).

- Thorwarth M, Schultze-Mosgau S, Wehrhan F, Kessler P, Srou S, Wiltfang J, Andreas Schlegel K. Bioactivation of an anorganic bone matrix by P-15 peptide for the promotion of early bone formation. *Biomaterials.* 2005 Oct;26(28):5648-57. Epub 2005 Apr 18.
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- Lindley EM, Guerra FA, Krauser JT, Matos SM, Burger EL, Patel VV. Small peptide (P-15) bone substitute efficacy in a rabbit cancellous bone model. *J Biomed Mater Res B Appl Biomater.* 2010 Aug;94(2):463-8.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN IMPROVED CELL VIABILITY COMPARED TO NON-TREATED ANORGANIC BONE (HYDROXYAPATITE) AND DEMINERALISED BONE ALLOGRAFT.

- Hanks T, Atkinson BL. Comparison of cell viability on anorganic bone matrix with or without P-15 cell binding peptide. *Biomaterials.* 2004 Aug;25(19):4831-6.
- Yuan K, Huang JS, Hsu CW, Hung IJ. A mineralization-associated membrane protein plays a role in the biological functions of the peptide-coated bovine hydroxyapatite. *J Periodontal Res.* 2007 Oct;42(5):420-8.

### THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN INCREASED EXPRESSION OF TRANSFORMING GROWTH FACTOR-B1, WHICH IS BELIEVED TO BE IMPORTANT IN THE DEVELOPMENT, INDUCTION AND REPAIR OF BONE.

- Hanks T, Atkinson BL. Comparison of cell viability on anorganic bone matrix with or without P-15 cell binding peptide. *Biomaterials.* 2004 Aug;25(19):4831-6.
- Yuan K, Huang JS, Hsu CW, Hung IJ. A mineralization-associated membrane protein plays a role in the biological functions of the peptide-coated bovine hydroxyapatite. *J Periodontal Res.* 2007 Oct;42(5):420-8.
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# PRE-CLINICAL EVIDENCE

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN EARLY BONE FORMATION AND FUSION IN A PRE-CLINICAL SPINE MODEL.

- Sherman BP, Lindley EM, Turner AS, Seim HB 3rd, Benedict J, Burger EL, Patel VV. Evaluation of ABM/P-15 versus autogenous bone in an ovine lumbar interbody fusion model. *Eur Spine J*. 2010 Dec;19(12):2156-63.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN GREATER TISSUE VOLUME FRACTION AND THICKER TRABECULAE COMPARED TO ALLOGRAFT IN THE SHEEP FEMUR.

- Ding M, Andreasen CM, Dencker ML, Jensen AE, Theilgaard N, Overgaard S. Efficacy of a small cell-binding peptide coated hydroxyapatite substitute on bone formation and implant fixation in sheep. *J Biomed Mater Res A*. 2015 Apr;103(4):1357-65.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ACCELERATES BONE REGENERATION IN A PRE-CLINICAL OSTEOPOROTIC RAT MODEL.

- Pedersen RH, Rasmussen M, Overgaard S, Ding M. Effects of P-15 Peptide Coated Hydroxyapatite on Tibial Defect Repair In Vivo in Normal and Osteoporotic Rats. *Biomed Res Int*. 2015;2015:253858.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ENHANCES BONE FORMATION COMPARED TO NON-TREATED ANORGANIC BONE (HYDROXYAPATITE) IN POSTEROLATERAL FUSION.

- Axelsen MG, Jespersen SM, Overgaard S, Ding M. Evaluation of cell binding peptide (P15) with silk fibre enhanced hydroxyapatite bone substitute for posterolateral spinal fusion in sheep. Eurospine 2015 Annual Meeting, Poster # P30.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ENHANCES BONE-TO-IMPLANT CONTACT AND OSSEOINTEGRATION OF TITANIUM IMPLANTS IN PRE-CLINICAL ANIMAL MODELS.

- Coelho PG, Teixeira HS, Marin C, Witek L, Tovar N, Janal MN, Jimbo R. The in vivo effect of P-15 coating on early osseointegration. *Journal of Biomedical Materials Research – Part B Applied Biomaterials* (2014) 102:3 (430-440).
- Lutz R, Srour S, Nonhoff J, Weisel T, Damien CJ, Schlegel KA. Biofunctionalization of titanium implants with a biomimetic active peptide (P-15) promotes early osseointegration. *Clinical Oral Implants Research* (2010) 21:7 (726-734).
- Nonhoff J, Moest T, Schmitt CM, Weisel T, Bauer S, Schlegel KA. Establishment of a new pull-out strength testing method to quantify early osseointegration – An experimental pilot study. *Journal of Cranio-Maxillofacial Surgery* (2015) 43:10 (1966-1973).

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ENHANCES OSSEOINTEGRATION AND MECHANICAL PULL-OUT STRENGTH (2x) OF TITANIUM IMPLANTS IN A PORCINE ANIMAL MODEL.

- Nonhoff J, Moest T, Schmitt CM, Weisel T, Bauer S, Schlegel KA. Establishment of a new pull-out strength testing method to quantify early osseointegration – An experimental pilot study. *Journal of Cranio-Maxillofacial Surgery* (2015) 43:10 (1966-1973).

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN SIGNIFICANTLY FASTER BONE FORMATION IN PRE-CLINICAL LONG-BONE DEFECTS.

- Lindley EM, Guerra FA, Krauser JT, Matos SM, Burger EL, Patel VV. Small peptide (P-15) bone substitute efficacy in a rabbit cancellous bone model. *J Biomed Mater Res B Appl Biomater*. 2010 Aug;94(2):463-8.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN SIGNIFICANTLY FASTER BONE FORMATION AND FUSION IN A PRE-CLINICAL CRANIAL MODEL.

- Thorwarth M, Schultze-Mosgau S, Wehrhan F, Kessler P, Srour S, Wiltfang J, Andreas Schlegel K. Bioactivation of an anorganic bone matrix by P-15 peptide for the promotion of early bone formation. *Biomaterials*. 2005 Oct;26(28):5648-57. Epub 2005 Apr 18.
- Artzi Z, Kozlovsky A, Nemcovsky CE, Moses O, Tal H, Rohrer MD, Prasad HS, Weinreb M. Histomorphometric evaluation of natural mineral combined with a synthetic cell-binding peptide (P-15) in critical-size defects in the rat calvaria. *Int J Oral Maxillofac Implants*. 2008 Nov-Dec;23(6):1063-70.
- Tovar N, Jimbo R, Gangolli R, Witek L, Lorenzoni F, Marin C, Manne L, Perez-Troisi L, Baldassarri M, Coelho PG. Modification of xenogeneic graft materials for improved release of P-15 peptides in a calvarium defect model. *Journal of Craniofacial Surgery* (2014) 25:1 (70-76).

# PRE-CLINICAL EVIDENCE

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN MORE BONE GROWTH COMPARED TO NON-TREATED ANORGANIC BONE (HYDROXYAPATITE) IN A RABBIT OSSEOUS DEFECT.

- Guerra FA, Krauser JT, Cabrita AM, et al. Small Peptide (P-15) Bone Substitute Efficacy in a Rabbit Cancellous Bone Model. ORS 2005 Annual Meeting, Poster # 0212.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN EQUIVALENT FUSION RATES TO AUTOLOGOUS BONE IN AN OVINE LUMBAR FUSION MODEL.

- Patel VV, Benedict JJ, Seim HB, Turner AS. Lumbar Spine Fusion in an Ovine Model Comparing P-15/BGS to Autogenous Bone. ORS 2007 Annual Meeting, Poster # 1452.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN SUPERIOR FUSION RATES COMPARED TO AUTOGRAFT IN A GOAT CERVICAL FUSION MODEL.

- Cheng BC, Moore DK, Zdeblick T. P-15: An Osteoconductive Protein to Enhance Healing of Interbody Cages. ORS 1998 Annual Meeting, Poster # 636.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN OPTIMUM HEALING OF SEGMENTAL CORTICAL BONE DEFECTS IN A RAT MODEL.

- Cakmak G, Bolukbasi S, Simsek A, Erdem O, Yilmaz G, Senkoğlu A. Effect of synthetic cell-binding peptide on the healing of cortical segmental bone defects. *Saudi Medical Journal*, Jun 2006;27(6): 777-80.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN ENHANCED NEW BONE FORMATION IN CORTICAL DEFECTS IN A RABBIT MODEL.

- Scarano A, Iezzi G, Petrone G, Orsini G, Degidi M, Strocchi R, Piatelli A. Cortical bone regeneration with a synthetic cell-binding peptide: a histologic and histomorphometric pilot study. *Implant Dent* 2003;12(4):318-24.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN FASTER NEW BONE FORMATION IN MAXILLARY SINUS DEFECTS COMPARED TO ALLOGRAFT.

- El-Madany I, Emam H, Sharawy M. Comparison of cellular response to anorganic bone matrix/cell binding peptide and allogenic cranial bone after sinus augmentation in rhesus monkeys. *J Oral Implantol*. 2011 Apr;37(2):233-45.

## THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ENHANCES FUSION IN THE MECHANICALLY DEMANDING PERIODONTAL ENVIRONMENT.

- Vastardis S, Yukna RA, Mayer ET, Atkinson BL. Periodontal regeneration with peptide-enhanced anorganic bone matrix in particulate and putty form in dogs. *J Periodontol*, 2005; Oct 76(10): 1690-1696.
- Scarano A, Iezzi G, Petrone G, Orsini G, Degidi M, Strocchi R, Piatelli A. Cortical bone regeneration with a synthetic cell-binding peptide a histologic and histomorphometric pilot study. *Implant Dentistry* 2003; 12(4): 318-24.
- Tehemar S, Hanes P, Sharawy M. Enhancement of osseointegration of implants placed into extraction sockets of healthy and periodontally diseased teeth by using graft material, an ePTFE membrane, or a combination. *Clinical Implant Dentistry and Related Research* 2003; 5(3): 193-211.
- Barboza E, Souza R, Caula A, Neto L, Caula F, Duarte M. Bone regeneration of localized chronic alveolar defects utilizing cell-binding peptide associated with anorganic bovine-derived bone mineral: a clinical and histological study. *Journal of Periodontology* 2002; 73(10):1153-9.
- Suaid FA, Macedo GO, Novaes Jr AB, Borges GJ, Souza SLS, Taba Jr M, Palioto DB, Grisi MFM. The bone formation capabilities of the anorganic bone matrix-synthetic cell-binding peptide 15 grafts in an animal periodontal model: A histologic and histomorphometric study in dogs. *Journal of Periodontology* (2010) 81:4 (594-603).

# CLINICAL EVIDENCE

## **i-FACTOR PEPTIDE-ENHANCED BONE GRAFT EXHIBITS SUPERIOR CLINICAL OUTCOMES COMPARED TO AUTOGRAFT (THE 'GOLD STANDARD') IN ANTERIOR CERVICAL DISCECTOMY AND FUSION.**

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