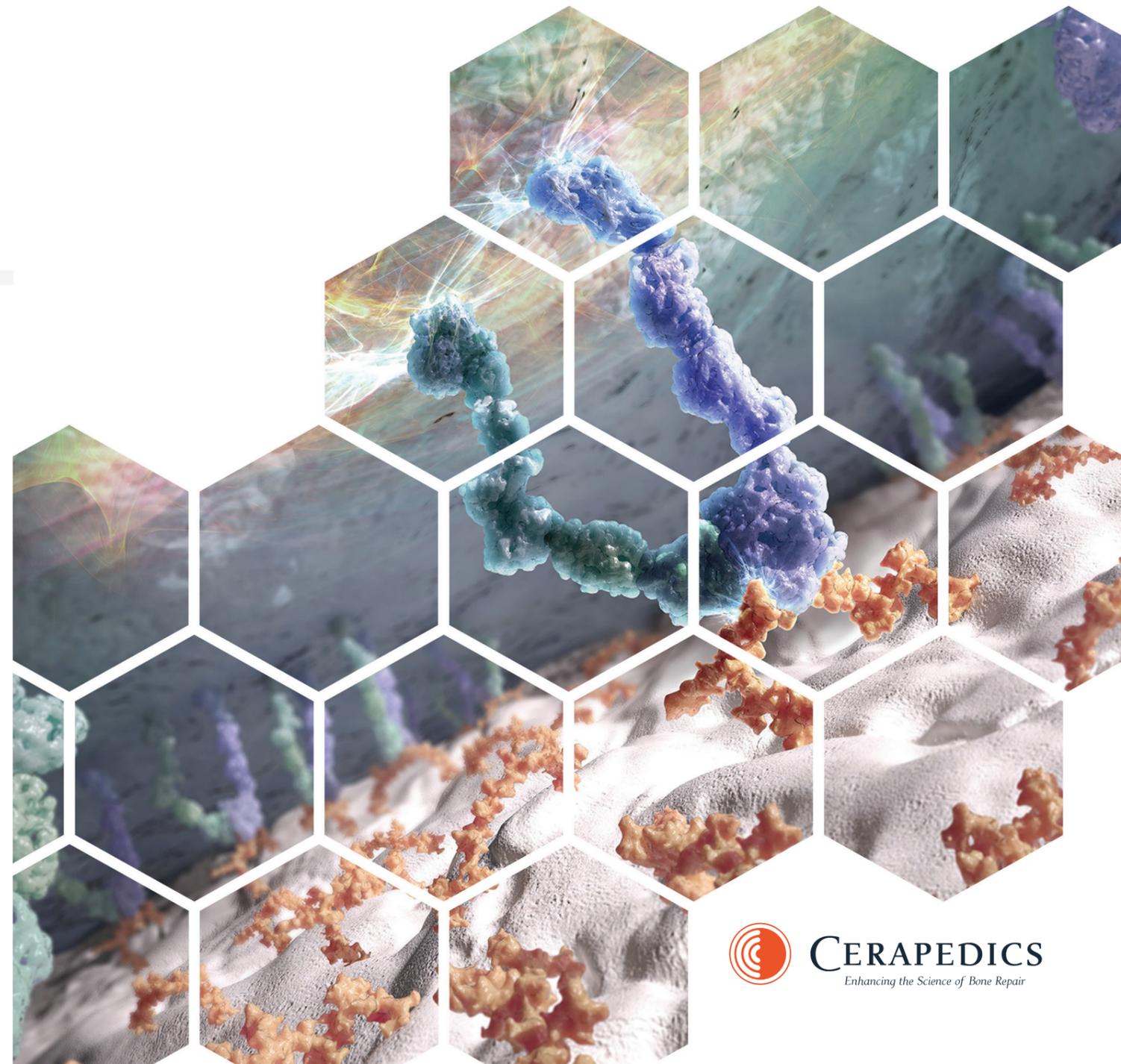


**THE EVIDENCE FOR P-15 OSTEOGENIC CELL BINDING PEPTIDE**  
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London, England  
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F: +1 (303) 845-9381  
E: emea@cerapedics.com



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# 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.
- 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.
- 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 Periodontol 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.
- 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.
- 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.
- 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.
- 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.
- 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, Tsiroidis 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, 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.

## 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, 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.
- Thorwarth M, Schultze-Mosgau S, Wehrhan F, Srour S, Wiltfang J, Neukam FW, Schlegel KA. Enhanced bone regeneration with a synthetic cell-binding peptide – in vivo results. *Biochem Biophys Res Commun*. 2005 Apr 8;329(2):789-95.
- 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 Periodontol 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 Periodontol Res*. 2007 Oct;42(5):420-8.
- 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.

# 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-Trois 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, Senkoylu 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.**

- Arnold PM, Sasso RC, Janssen ME, Fehlings MG, Heary RF, Vaccaro AR, Kopjar B. i-Factor™ Bone Graft vs Autograft in Anterior Cervical Discectomy and Fusion: 2-Year Follow-up of the Randomized Single-Blinded Food and Drug Administration Investigational Device Exemption Study. *Neurosurgery*. 2018 Sep 1;83(3):377-384. doi: 10.1093/neuros/nyx432. PubMed PMID: 28945914.
- Arnold PM, Sasso RC, Janssen ME, Fehlings MG, Smucker JD, Vaccaro AR, Heary RF, Patel AI, Goulet B, Kalfas IH, Kopjar B. i-Factor™ Bone Graft versus Autograft in Anterior Cervical Discectomy and Fusion. Results of the Prospective Randomized Single-blinded Food and Drug Administration Investigational Device Exemption Study. *Spine*. 2016; 41 (13): 1075-1083.
- Fehlings MG, Janssen M, Sasso R. P-15 Bone Putty – A Novel Bone Graft Substitute for Use in Cervical Spinal Fusion: Early Results of a Multi-Center Randomized Controlled Trial with Independent Outcomes Assessment. AANS/CNS Section on Disorders of the Spine and Peripheral Nerves, February 27 – March 1, 2008, Orlando, FL, Poster No. 348.
- Patel A, Sasso R, Fehlings M. P-15 Bone Putty in Cervical Spinal Fusion for Degenerative Disk Disease: Intermediate Results of Randomized Controlled Trial SpineweeK 2008, May 26-31, 2008, Geneva, Switzerland, Poster No. P49.
- Patel A, Sasso RC, Janssen ME. i-FACTOR Bone Graft – a novel bone graft substitute for use in cervical spinal fusion. Early results of an FDA IDE multi-center randomized controlled trial with independent outcomes assessments. 25th Annual Meeting of the Cervical Spine Research Society – European Section, June 10-13, 2009, Uppsala, Sweden, Poster No. P6.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT DEMONSTRATES A HIGHER LEVEL OF FUSION COMPARED TO BONE BANK ALLOGRAFT IN NON-INSTRUMENTED LUMBAR FUSION SURGERY.**

- Jacobsen MK, Andresen AK, Jespersen AB, et al. Randomized double blind clinical trial of ABM/P-15 versus allograft in non-instrumented lumbar fusion surgery. *Spine J*. 2020; 20: 677-684.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT IS STATISTICALLY SIGNIFICANTLY SUPERIOR TO AUTOLOGOUS BONE IN FACILITATING FORMATION OF BRIDGING BONE INSIDE PLIF CAGES.**

- Lauweryns P, Raskin Y. Prospective analysis of a new bone graft in lumbar interbody fusion: results of a 2-year prospective clinical and radiological study. *Int J Spine Surg*. 2015 Feb 3;9.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT DEMONSTRATES A HIGH FUSION RATE AND CLINICAL IMPROVEMENTS COMPARABLE TO ALIF USING AUTOGRAFT OR BMP, BUT WITH A SUPERIOR SAFETY PROFILE AND LOWER COST.**

- Mobbs RJ, Maharaj M, Rao PJ. Clinical outcomes and fusion rates following anterior lumbar interbody fusion with bone graft substitute i-FACTOR, an anorganic bone matrix/P-15 composite. *J Neurosurg Spine*. 2014 Dec;21(6):867-76.
- Mobbs RJ. Prospective Analysis of Graft Options for Anterior Lumbar Interbody Fusion (ALIF): Fusion and Complication Rates. Spine Society of Australia. Melbourne, 2011.
- Rao PJ, Loganathan A, Yeung V, Mobbs RJ. Outcomes of anterior lumbar interbody fusion surgery based on indication: a prospective study. *Neurosurgery*. 2015 Jan 76(1):7-23; discussion 23-4.
- Rao PJ, Phan K, Giang G, Maharaj MM, Phan S, Mobbs RJ. Subsidence following anterior lumbar interbody fusion (ALIF): a prospective study. *J Spine Surg*. 2017 Jun 3(2):168-175.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT PROVIDES A HIGH LEVEL OF BONE CONSOLIDATION IN CHALLENGING LONG-BONE NON-UNION AND DELAYED UNIONS.**

- Gomar F, Orozco R, Villar JL, Arrizabalaga F. P-15 small peptide bone graft substitute in the treatment of non-unions and delayed union. A pilot clinical trial. *Int Orthop*. 2007 Feb;31(1):939. Epub 2006 Jun 8.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT PROVIDES A HIGHER RATE OF FUSION IN TRANSFORAMINAL LUMBAR INTERBODY FUSION COMPARED TO ACTIFUSE® AND VITOSS®.**

- Berg AJ, Tankel JA, Jensen CD, Hernandez M, Bhatia C, Reddy GR, Friesem T. Transforaminal Lumbar Interbody Fusion Rates with Actifuse®, i-FACTOR™ and Vitoss® BA Synthetic Bone Grafts. Accepted as poster, ISASS-14 April 2014, and 15th EFORT Congress in London, June 2014.

# CLINICAL EVIDENCE

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT PROVIDES RELIABLE FUSION IN CERVICAL INTERBODY FUSION (80% FUSED AND 17% PROGRESSING TO FUSION AT 26 WEEKS FOLLOW-UP).**

- Berg AJ, Tankel JA, Jensen CD, Hernandez M, Bhatia C, Reddy GR, Friesem T. Cervical Interbody Fusion Rates with i-FACTOR™ Peptide Enhanced Bone Graft. Accepted as poster, ISASS-14 April 2014, and 15th EFORT Congress in London, June 2014.

## **i-FACTOR PEPTIDE ENHANCED BONE GRAFT RESTORES NEAR NORMAL BONE POROSITY AND TRABECULAR ORIENTATION IN ACDF.**

- Kesteloot G, Parish AJB, Johnson S, McNally DS. Three Dimensional remodelling of i-FACTOR Peptide Enhanced Bone Graft substitute in cervical fusions. Accepted as poster, Annual Scientific Meeting of the Belgian Society of Neurosurgery, March 2016.

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT EXHIBITS GREATER DEFECT FILL COMPARED TO FREEZE-DRIED BONE ALLOGRAFT AND OPEN-FLAP DEBRIDEMENT IN PERIODONTAL OSSEOUS DEFECTS.**

- Yukna RA, Callan DP, Krauser JT, Evans GH, Aichelmann-Reidy ME, Moore K, Cruz R, Scott JB. Multi-center clinical evaluation of combination anorganic bovine-derived hydroxyapatite matrix (ABM)/cell binding peptide (P-15) as a bone replacement graft material in human periodontal osseous defects. 6-month results. *J Periodontol*. 1998 Jun;69(6):655-63.

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT EXHIBITS GREATER DEFECT FILL AND SUPERIOR CLINICAL RESULTS COMPARED TO ANORGANIC HYDROXYAPATITE BONE MATRIX IN PERIODONTAL OSSEOUS DEFECTS.**

- Yukna RA, Krauser JT, Callan DP, Evans GH, Cruz R, Martin M. Multi-center clinical evaluation of combination anorganic bovine bone-derived hydroxyapatite matrix (ABM)/cell-binding peptide (P-15) and ABM in human periodontal osseous defects: 6-month results. *J Periodontol*. 2000 Nov;71(11):1671-9.

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT IS EFFECTIVE IN THE LONG-TERM MANAGEMENT OF INFRABONY DEFECTS AFTER THREE YEAR FOLLOW-UP.**

- Yukna RA, Grauser JT, Callan DP, Evans GH, Cruz R, Martin M. Thirty-six month follow-up of 25 patients treated with combination anorganic bovine-derived hydroxyapatite matrix (ABM)/cell-binding peptide (P-15) bone replacement grafts in human infrabony defects. *J Periodontol*. 2002 Jan;73(1):123-128.

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT OFFERS SIGNIFICANTLY IMPROVED DEFECT FILL AND CLINICAL OUTCOMES COMPARED TO OPEN-FLAP DEBRIDEMENT.**

- Kasaj A, Röhrig B, Reichert C, Willershausen B. Clinical evaluation of anorganic bovine-derived hydroxyapatite matrix/cell-binding peptide (P-15) in the treatment of human infrabony defects. *Clin Ora Invest* 2008 Sep;12(3):241-247.
- Bhongade ML, Tiwari IR. A comparative evaluation of the effectiveness of an anorganic bone matrix/cell binding peptide with an open flap debridement in human infrabony defects: A clinical and radiographic study. *Journal of Contemporary Dental Practice* (2007) 8:6 (25-34).

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT SIGNIFICANTLY INCREASES THE BONE REGENERATION IN COMBINATION WITH PLATELET RICH PLASMA (PRP) COMPARED TO PRP ALONE IN CLINICAL INTRABONY DEFECTS.**

- Pradeep AR, Shetty SK, Garg G, Pai S. Clinical effectiveness of autologous platelet-rich plasma and peptide-enhanced bone graft in the treatment of intrabony defects. *Journal of Periodontology* (2009) 80:1 (62-71).

## **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT ACCELERATES NEW BONE FORMATION AND INCREASES BONE MINERAL DENSITY COMPARED TO NATIVE BONE IN MAXILLARY SINUS AUGMENTATION.**

- Emam HA, Behiri G, El-Alaily M, Sharawy M. The efficacy of a tissue-engineered xenograft in conjunction with sodium hyaluronate carrier in maxillary sinus augmentation: A clinical study. *International Journal of Oral and Maxillofacial Surgery* (2015) 44:10 (1287-1294).
- Emam H, Stevens M, Ferguson HA, Behiri G, Sharawy M. Three dimensional analysis of ABM/ P-15 with sodium hyaluronate carrier in sinus augmentation. *Journal of Oral and Maxillofacial Surgery* (2012) 70:9 Suppl. 2 (e-29).

## CLINICAL EVIDENCE

- Emam H, Beheiri G, Elsalanty M, Sharawy M. Microcomputed tomographic and histologic analysis of anorganic bone matrix coupled with cell-binding peptide suspended in sodium hyaluronate carrier after sinus augmentation: a clinical study. *International Journal of Oral & Maxillofacial Implants* (2011) 26:3 (561-570)

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT SIGNIFICANTLY IMPROVED DEFECT FILL COMPARED TO BASELINE PARAMETERS IN PERIODONTAL OSSEOUS DEFECTS.**

- Matos SM, Guerra FA, Krauser J, Marques F, Ermida JM, Sanz M. Clinical evaluation of the combination of anorganic bovine-derived hydroxyapatite matrix/cell-binding peptide (P-15) in particulate and hydrogel form as a bone replacement graft material in human periodontal osseous defects: 6-month reentry controlled clinical study. *Journal of Periodontology* (2007) 78:10 (1855-1863).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT PROVIDES GREATER BONE FILL AND INCREASES BONE MINERAL DENSITY (93% vs 62%) COMPARED TO GUIDED REGENERATION IN THE TREATMENT OF AGGRESSIVE PERIODONTITIS.**

- Queiroz AC, Nábrega PB, Oliveira FS, Novaes AB, Taba M, Palioto DB, Grisi MF, Souza SL. Treatment of intrabony defects with anorganic bone matrix/p-15 or guided tissue regeneration in patients with aggressive periodontitis. *Brazilian Dental Journal* (2013) 24:3 (204-212).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT PROVIDES GREATER TISSUE REGENERATION COMPARED TO BASELINE AND TISSUE FLAP CONTROL IN GINGIVAL RECESSION DEFECTS.**

- Nazareth CA, Cury PR. Use of anorganic bovine-derived hydroxyapatite matrix/cell-binding peptide (P-15) in the treatment of isolated Class I gingival recession defects: A pilot study. *Journal of Periodontology* (2011) 82:5 (700-707).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT PROVIDES SIGNIFICANTLY GREAT DEFECT FILL COMPARED TO OPEN-FLAP DEBRIDEMENT ALONE IN PERIODONTAL OSSEOUS DEFECTS.**

- Radhakrishnan S, Anusuya CN. Comparative clinical evaluation of combination anorganic bovine-derived hydroxyapatite matrix (ABM)/cell binding peptide (P-15) and open flap debridement (DEBR) in human periodontal osseous defects: a 6 month pilot study. *Journal of the International Academy of Periodontology* (2004) 6:3 (101-107).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT DEVELOPS LAMINAR BONE STRUCTURE FASTER THAN PLATELET-RICH PLASMA IN MAXILLARY SINUS AUGMENTATION.**

- Gelbart M, Friedman R, Burlui V, Rohrer M, Atkinson B. Maxillary sinus augmentation using a peptide-modified graft material in three mixtures: A prospective human case series of histologic and histomorphometric results. *Implant Dentistry* (2005) 14:2 (185-193).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES TISSUE REGENERATION AND CLINICALLY MEANINGFUL IMPROVEMENT IN DEFECT FILL IN PERIODONTAL DEFECTS.**

- Barros RRM, Novaes Jr AB, Roriz VM, Oliveira RR, Grisi MFM, Souza SLS, Taba Jr M, Palioto DB. Anorganic bovine matrix/P-15 'flow' in the treatment of periodontal defects: Case series with 12 months of follow-up. *Journal of Periodontology* (2006) 77:7 (1280-1287).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES SIGNIFICANTLY HIGHER VITAL BONE VOLUME COMPARED TO HYDROXYAPATITE AND CANCELLOUS BONE IN HUMAN EXTRACTION SOCKETS.**

- Thompson DM, Rohrer MD, Prasad HS. Comparison of bone grafting materials in human extraction sockets: clinical, histologic, and histomorphometric evaluations. *Implant Dentistry* (2006) 15:1 (89-96).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN SUPERIOR BONE DEFECT FILL AND BONE DENSITY COMPARED TO NON-GRAFTED SITES AND SIGNIFICANTLY REDUCES THE NEED FOR REVISION PROCEDURES IN ALVEOLAR RIDGE AUGMENTATION.**

- Neiva RF, Tsao Y-P, Eber R, Shotwell J, Billy E, Wang H-L. Effects of a putty-form hydroxyapatite matrix combined with the synthetic cell-binding peptide P-15 on alveolar ridge preservation. *Journal of Periodontology* (2008) 79:2 (291-299).

## CLINICAL EVIDENCE

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN SUPERIOR BONE QUALITY AND QUANTIFY (3X MORE VITAL BONE) COMPARED TO HYDROXYAPATITE IN SINUS ELEVATION PROCEDURES.**

- Smiler DG. Comparison of anorganic bovine mineral with and without synthetic peptide in a sinus elevation: a case study. *Implant Dentistry* (2001) 10:2 (139-142).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT YIELDED BONE WHICH WAS HISTOLOGICALLY SIMILAR TO NATIVE BONE FOLLOWING RECONSTRUCTION IN HUMAN EXTRACTION SOCKETS.**

- Hahn J, Rohrer MD, Tofe AJ. Clinical, radiographic, histologic, and histomorphometric comparison of PepGen P-15 particulate and PepGen P-15 flow in extraction sockets: a same-mouth case study. *Implant Dentistry* (2003) 12:2 (170-174).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT RESULTS IN BONE REGENERATION AND RESOLUTION OF CLINICAL SYMPTOMS ASSOCIATED WITH ACTIVE PERI-IMPLANTITIS.**

- Lu SY, Huang CC. Resolution of an active peri-implantitis in a chronic steroid user by bone augmentation with PepGen P-15 and a barrier membrane. *Journal of Oral Implantology* (2007) 33:5 (280-287).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES EARLY BONE FORMATION WITH THE POTENTIAL TO PLACE INSTRUMENTATION EARLIER IN SINUS AUGMENTATIONS.**

- Degidi M, Scarano A, Iezzi G, Orsini G, Perrotti V, Strocchi R, Piattelli A. Maxillary sinus augmentation using a synthetic cell-binding peptide: a histologic and transmission electron microscopy case study in man. *Implant Dentistry* (2005) 14:4 (371-375).
- Butz F, Bächle M, Ofer M, Marquardt K, Kohal RJ. Sinus augmentation with bovine hydroxyapatite/synthetic peptide in a sodium hyaluronate carrier (PepGen P-15 Putty): a clinical investigation of different healing times. *International Journal of Oral & Maxillofacial Implants* (2011) 26:6 (1317-1323).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT HAS THE ABILITY TO PROVIDE LONG-TERM IMPLANT STABILITY AT 8-YEAR FOLLOW-UP IN ALVEOLAR RIDGE AUGMENTATION.**

- Hahn J. 8-year onlay bone graft and ridge augmentation with PepGen P-15: a clinical and radiographic case study. *Implant Dentistry* (2004) 13:3 (228-231).

### **THE SYNTHETIC P-15 PEPTIDE IN i-FACTOR PEPTIDE-ENHANCED BONE GRAFT STIMULATES MORE BONE REGENERATION COMPARED TO HYDROXYAPATITE IN MAXILLARY SINUS ELEVATION PROCEDURE.**

- Krauser JT, Rohrer MD, Wallace SS. Human histologic and histomorphometric analysis comparing OsteoGraf/N with PepGen P-15 in the maxillary sinus elevation procedure: a case report. *Implant Dentistry* (2000) 9:4 (298-302).