

Dental



# DENTAL REPAIR Solutions



**COLLAGEN MATRIX**  
SCIENCE • TECHNOLOGY • INNOVATION

## Science • Technology • Innovation

At Collagen Matrix we are passionate about advancing the science of tissue repair and regeneration. That's why we're the driving force in the design, development and manufacturing of advanced collagen and mineral based medical devices that support the body's natural ability to regenerate.

Over our 20 years of proven performance, we have focused our proprietary technologies and innovative products to meet clinical needs through five key business units – Dental, Spine, Orthopaedic, Dural Repair and Nerve Repair.

## Proven Performance

### Six Platform Technologies

We have developed six proprietary tissue engineering technologies to expand our broad line of collagen and mineral based medical device solutions.

T1 – Reconstituted Collagen

T2 – Intact Collagen

T3 – Natural Carbonate Apatite Mineral

T4 – Collagen and Mineral Composites

T5 – Collagen Coatings

T6 – Crosslinking



## Evolution of **Dental** Products





## Collagen Membranes

Matrixflex™, MatrixDerm®, MatrixDerm® EXT, MatrixDerm® Cap, and MatrixMem™ membranes are intended for use in oral surgical procedures. These resorbable materials are for use in augmentation around implants placed in immediate extraction sockets, delayed extraction sockets, localized ridge augmentation for later implantation, alveolar ridge reconstruction for prosthetic treatment, filling of bone defects, guided bone regeneration in dehiscence defects and guided tissue regeneration procedures in periodontal defects.

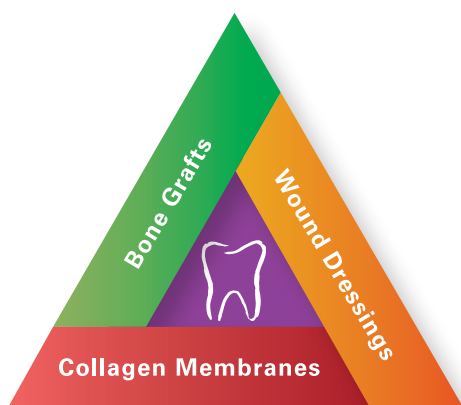
## Wound Dressings

Collatene™ Microfibrillar Collagen and MatrixDerm® Dental Wound Dressings are absorbent collagen matrices intended for the management of oral wounds and sores. They are indicated for use for denture sores, oral ulcers (*non-infected or viral*), periodontal surgical wounds, suture sites, burns, extraction sites, surgical wounds, and traumatic wounds.



# 7.5million

Our products have helped patients worldwide with over 7.5 million medical devices that have been produced across all five key business units.



## Bone Grafts

MatrixOss™ Granules and MatrixOss™ in Syringe, SynOss™ Plug, SynOss™ Granules and SynOss™ Putty deliver choices to clinicians by providing exceptionally high quality xenograft and synthetic alternatives to human bone graft materials.

Our products are indicated for use in bone repair such as augmentation or reconstructive treatment of the alveolar ridge and filling of periodontal defects. In addition, they are suitable for use in conjunction with products intended for Guided Tissue Regeneration and Guided Bone Regeneration and for filling defects after root resection, filling extraction sockets, and elevating the maxillary sinus floor.

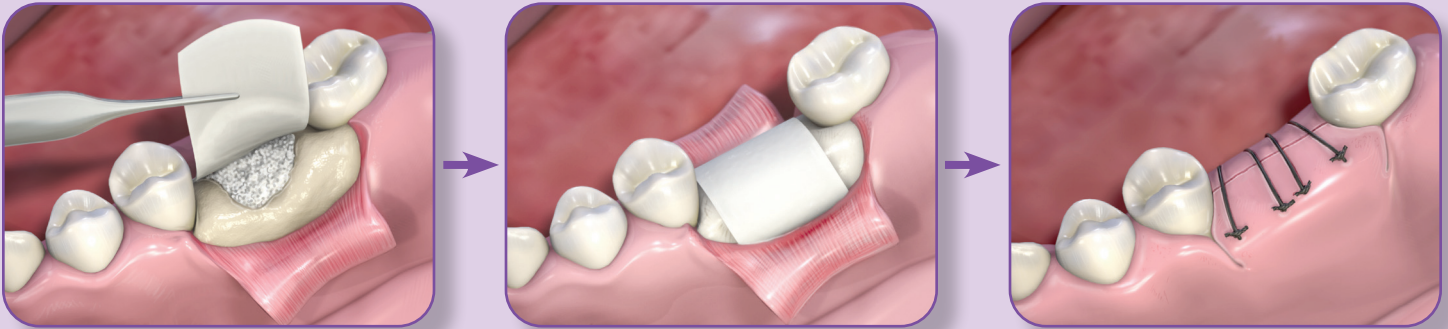




# Membranes at-a-glance

## Why use membranes?

- ❖ The membrane is used as a cell barrier to prevent soft tissue ingrowth in the defect site
- ❖ Contains bone graft material
- ❖ Supports wound healing in guided tissue and bone regeneration procedures



## Our collagen membranes are...

- ❖ Highly purified collagen derived from porcine tissue. Porcine animals are considered a non-TSE relevant species
- ❖ Highly biocompatible
- ❖ Programmed for different resorption times to accommodate various applications
- ❖ Suturable with easy handling due to their structural integrity
- ❖ Not side specific, either side can be placed facing bone or soft tissue
- ❖ Easily repositionable to precise adjustment and placement. They do not stick to instruments
- ❖ Permeable to macromolecules and nutrients while creating an effective barrier to epithelial cells

Product	Material Source	Handling (conformability)	Strength (suture pull avg)	Resorption Time
Matrixflex™	Porcine peritoneum	High (very drapeable)	High 0.83 kg	3-4 months
MatrixMem™	Porcine tendon	Moderate	Low 0.28 kg	4-6 months
MatrixDerm®	Porcine dermis	Moderate	Moderate 0.46 kg	6-9 months
MatrixDerm® EXT	Porcine dermis	Low (space maintaining)	High 0.67 kg	9-12 months
MatrixDerm® Cap	Porcine dermis	Low (space maintaining)	Moderate 0.51 kg	9-12 months





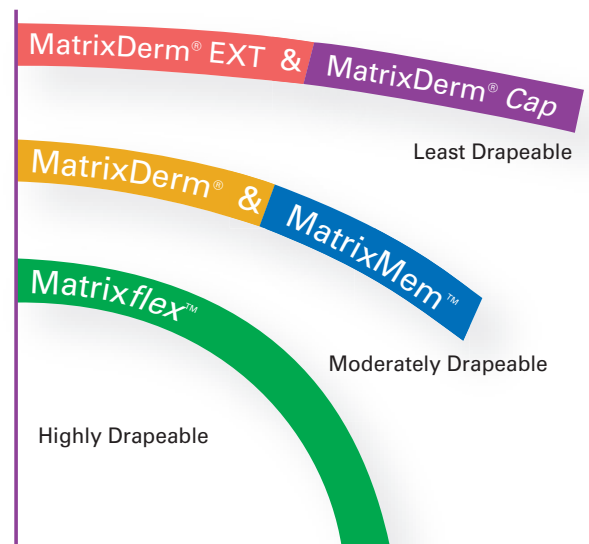
# Membrane characteristics

The two key design parameters that we have identified in the development of the membranes are:

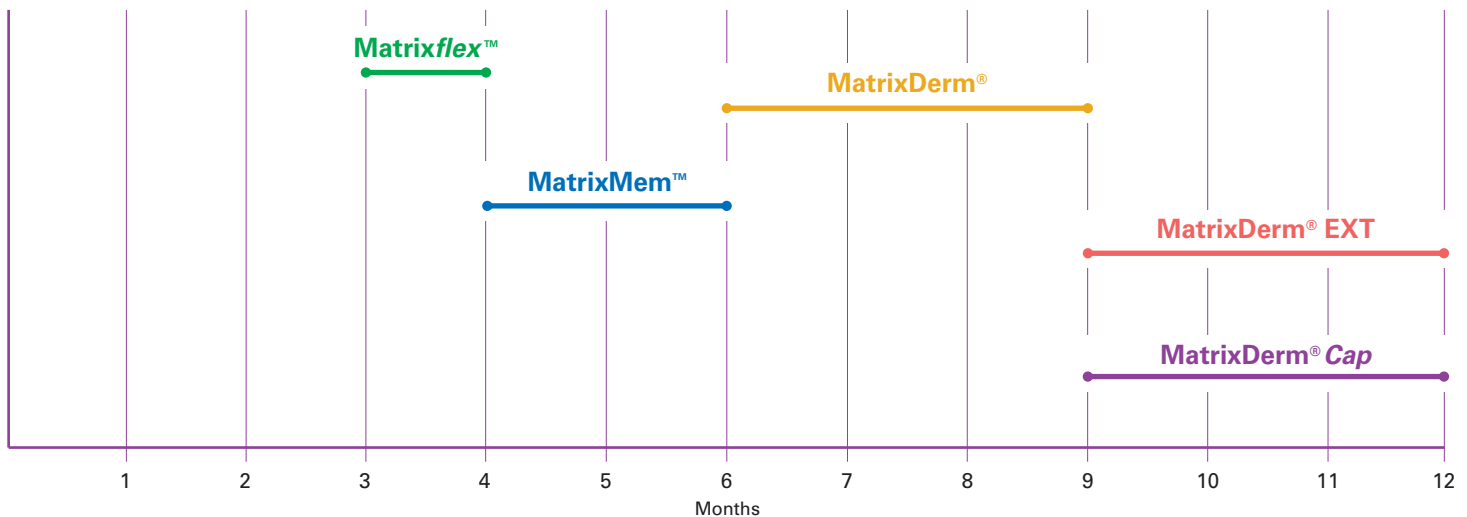
- ❖ Handling characteristics: Conformability vs. Stiffness
- ❖ Resorption time

This allows the clinician to select the most ideal membrane for the clinical indication.

## Conformability



## Resorption



Membranes can be used in the following types of dental surgeries:

- ❖ In augmentation around implants placed in immediate extraction sockets, delayed extraction sockets
- ❖ Localized ridge augmentation for later implantation
- ❖ Alveolar ridge reconstruction for prosthetic treatment
- ❖ Filling of bone defects
- ❖ Guided bone regeneration in dehiscence defects and guided tissue regeneration procedures in periodontal defects



## REGENERATIVE COLLAGEN DENTAL MEMBRANE

Matrixflex™ regenerative collagen dental membrane is a strong, conformable collagen barrier membrane manufactured from purified porcine peritoneum tissue.

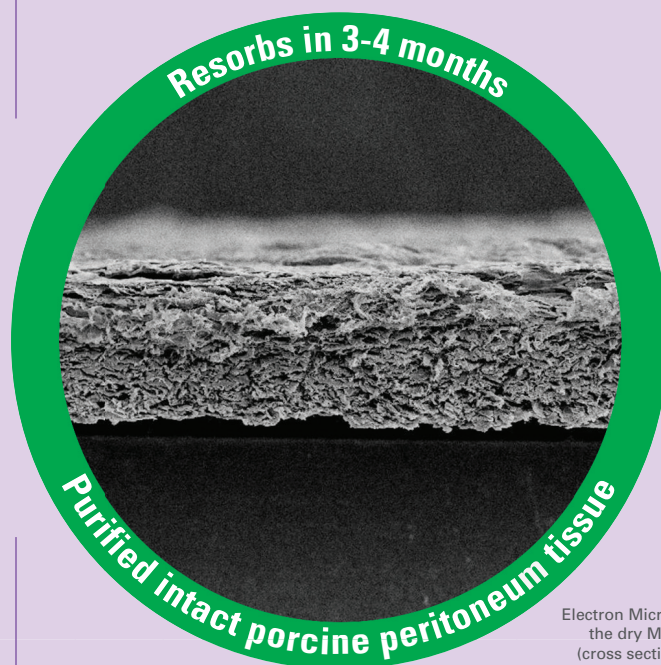
Matrixflex™ is designed to provide a very drapable yet very strong membrane.

### Product Features:

- ❖ Resorbable in 3-4 months
- ❖ High mechanical strength
- ❖ Highly purified intact porcine peritoneum tissue

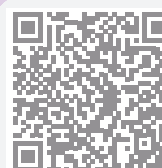


**Highly  
Drapeable**



Scanning  
Electron Micrograph of  
the dry Matrixflex™  
(cross section) at 50x  
magnification

CATALOG NO.	SIZE
CDMPP1520	15mm x 20mm
CDMPP2030	20mm x 30mm
CDMPP3040	30mm x 40mm



Scan  
here  
to view  
product demo  
video



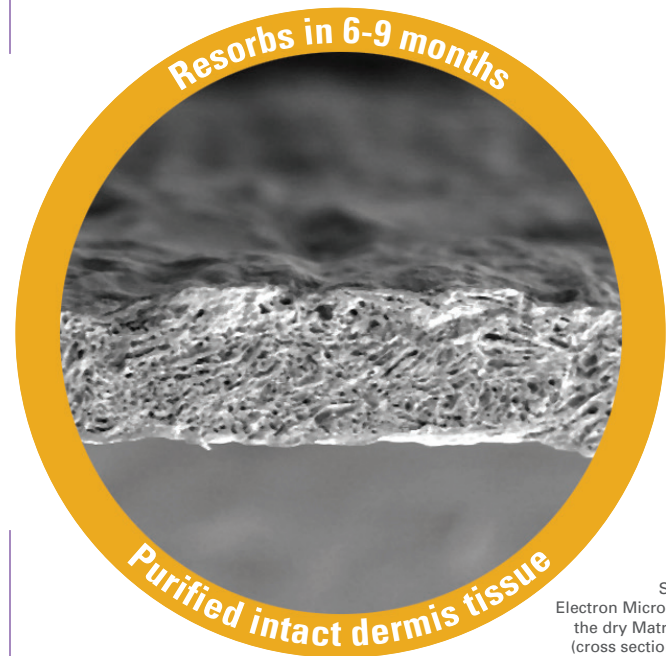
## REGENERATIVE COLLAGEN DENTAL MEMBRANE

MatrixDerm® regenerative collagen dental membrane has enhanced characteristics to provide periodontal and dental surgeons with the ideal balance of properties to effectively address a host of clinical indications and surgical procedures. The product is manufactured from porcine dermis tissue.

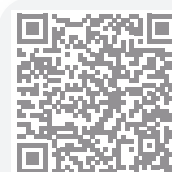
### Product Features:

- ❖ Resorbable in 6-9 months
- ❖ Highly purified intact dermis tissue
- ❖ Balanced characteristics of handling, strength, and resorption time
- ❖ High mechanical strength

CATALOG NO.	SIZE
PDM1520	15mm x 20mm
PDM2030	20mm x 30mm
PDM3040	30mm x 40mm



Scanning Electron Micrograph of the dry MatrixDerm® (cross section) at 50x magnification



Scan here to view product demo video





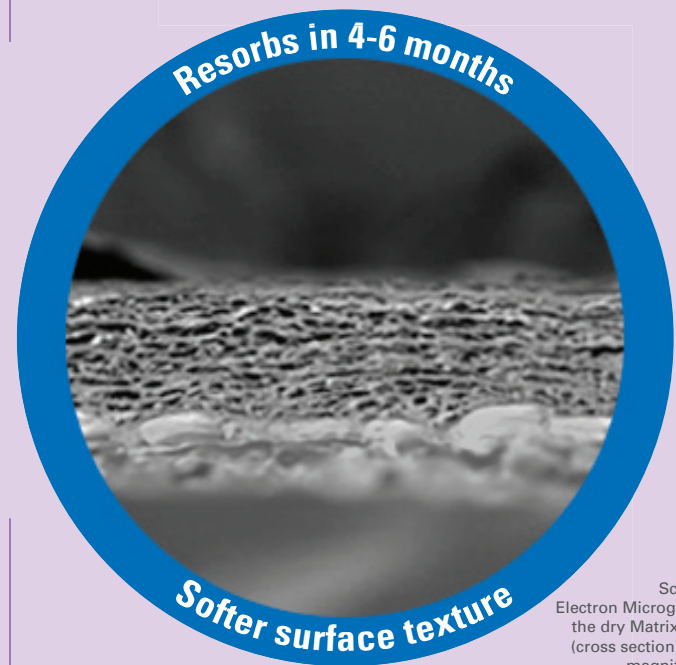
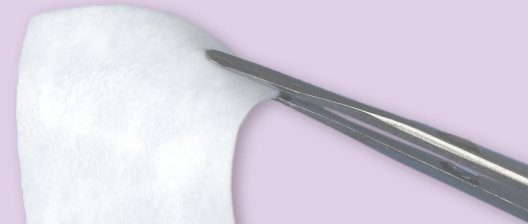
## REGENERATIVE COLLAGEN DENTAL MEMBRANE

MatrixMem™ regenerative collagen dental membrane is a white, nonfriable, conformable membrane matrix engineered from highly purified type I collagen derived from porcine tendon.

### Product Features:

- ❖ Resorbable in 4-6 months
- ❖ Highly purified type I collagen derived from porcine Achilles tendon
- ❖ Moderately drapeable
- ❖ Softer surface texture

CATALOG NO.	SIZE
CMPT1520	15mm x 20mm
CMPT2030	20mm x 30mm
CMPT3040	30mm x 40mm



Scanning Electron Micrograph of the dry MatrixMem™ (cross section) at 50x magnification



Scan here to view product demo video



# MatrixDerm® EXT

**EXTENDED**  
resorption

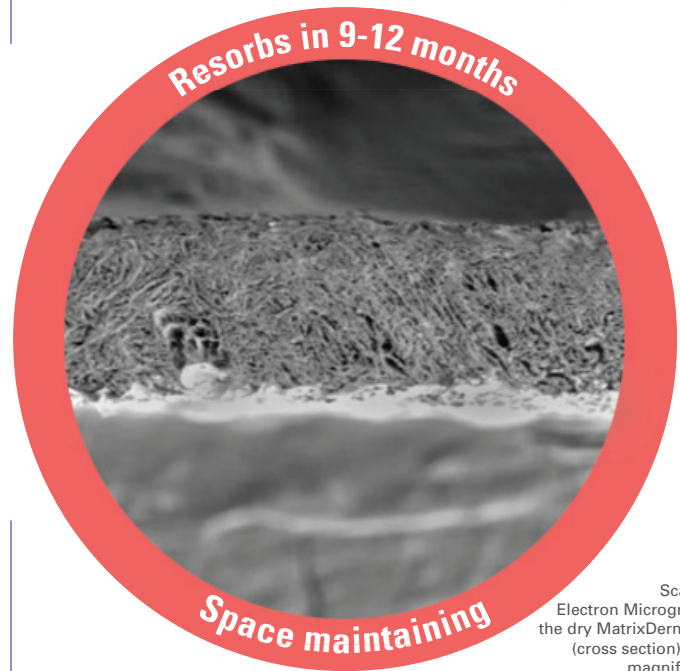
## REGENERATIVE COLLAGEN DENTAL MEMBRANE WITH EXTENDED RESORPTION TIME

MatrixDerm® EXT regenerative collagen dental membrane is a white, nonfriable membrane matrix engineered from highly purified porcine dermis.

### Product Features:

- ❖ Resorbable in 9-12 months
- ❖ Highly purified intact thicker dermis tissue
- ❖ Longer *in-vivo* stability
- ❖ Quick hydration time in seconds
- ❖ High mechanical strength

CATALOG NO.	SIZE
PDMX1520	15mm x 20mm
PDMX2030	20mm x 30mm
PDMX3040	30mm x 40mm



Scanning  
Electron Micrograph of  
the dry MatrixDerm® EXT  
(cross section) at 50x  
magnification



Scan  
here  
to view  
product demo  
video



# MatrixDerm® Cap

**EXTENDED**  
resorption

## REGENERATIVE COLLAGEN DENTAL MEMBRANE WITH EXTENDED RESORPTION TIME

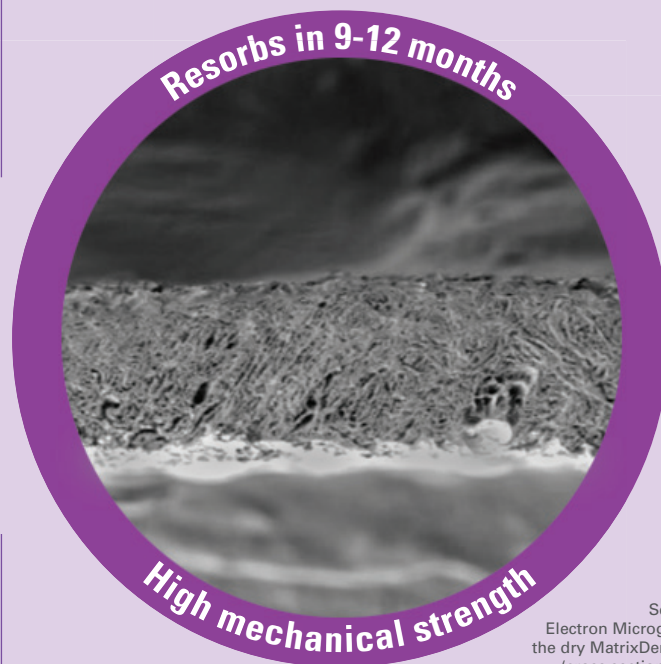
MatrixDerm® Cap regenerative collagen dental membrane cap is a white, nonfriable membrane matrix engineered from highly purified porcine dermis. It is indicated for oral surgical procedures as a resorbable material for use in extraction sockets and small bone defects.

MatrixDerm® Cap was specifically designed to meet the needs for socket ridge preservation procedures, and it has a slight curve when hydrated to facilitate placement.

### Product Features:

- ❖ Resorbable in 9-12 months
- ❖ Highly purified intact thicker dermis tissue
- ❖ Curves upon hydration
- ❖ Longer *in-vivo* stability
- ❖ Quick hydration time in seconds
- ❖ High mechanical strength

CATALOG NO.	SIZE
PDMC1216	12mm x 16mm



Scanning  
Electron Micrograph of  
the dry MatrixDerm® Cap  
(cross section) at 50x  
magnification



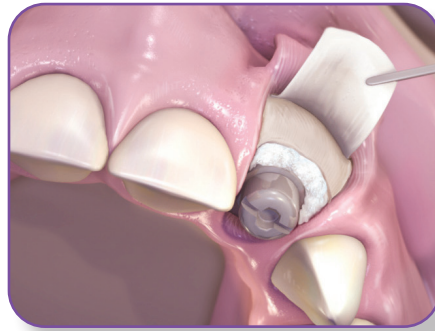
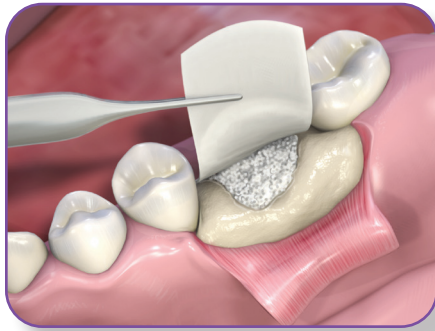
Scan  
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to view  
product demo  
video





# Bone Grafts at-a-glance

Collagen Matrix offers both a xenograft-derived bone graft matrix and a synthetic calcium phosphate bone graft matrix.



## Our bone grafts can be used for:

- ❖ Augmentation or reconstructive treatment of the alveolar ridge
- ❖ Filling of infrabony periodontal defects
- ❖ Filling of defects after root resection, apicoectomy, and cystectomy
- ❖ Filling of extraction sockets to enhance preservation of the alveolar ridge
- ❖ Elevation of the maxillary sinus floor
- ❖ Filling of periodontal defects in conjunction with products intended for Guided Tissue Regeneration (GTR) and Guided Bone Regeneration (GBR)
- ❖ Filling of peri-implant defects in conjunction with products intended for Guided Bone Regeneration (GBR)

Product	Material Source	Particle Size Range	Form/ Configuration	Volume Fill	Void Space (Porosity)
MatrixOss™ Granules	Anorganic Porcine Bone Mineral (Cancellous)	0.25 - 1.0 mm	Granules	3 cc / gram	88%
MatrixOss™ Granules	Anorganic Porcine Bone Mineral (Cancellous)	1.0 - 2.0 mm	Granules	4 cc / gram	95%
SynOss™ Granules	Synthetic Carbonate Apatite	0.35 - 1.0 mm	Granules	2 cc / gram	81%
SynOss™ Putty	Synthetic Carbonate Apatite & Bovine Type I Collagen	0.35 - 1.0 mm	Putty	0.5cc, 1.0cc and 2.0cc	88%

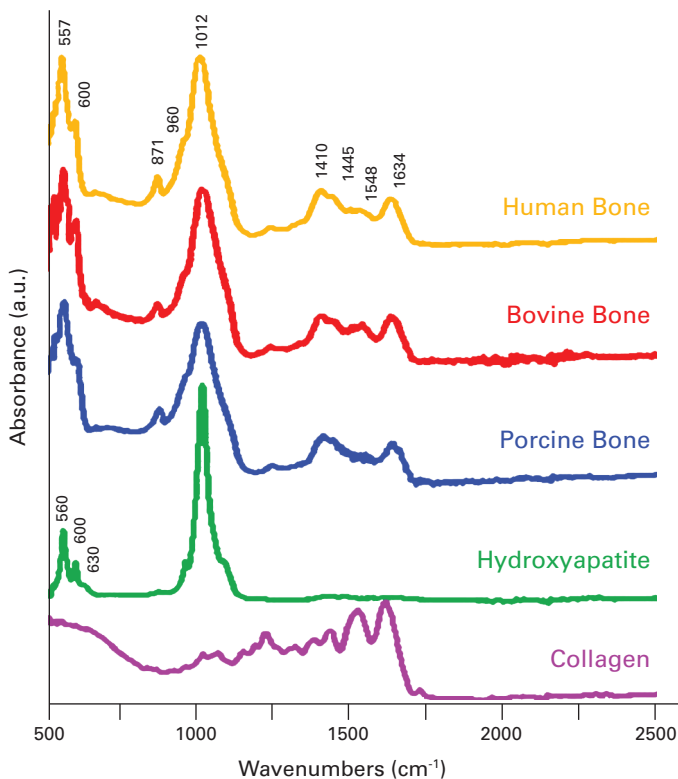


# Why Carbonate Apatite?

## 1 Mineral structure similar to natural bone mineral

- Naturally occurring bone mineral is a calcium phosphate apatite with 2-8 wt % carbonate ion substitution. Unlike highly crystalline hydroxyapatite, carbonate apatite in bone has a lower degree of crystallinity, which allows the bone mineral to be remodeled *in-vivo*.<sup>(1,2,3)</sup>

### IR Spectra for human, bovine & porcine bones hydroxyapatite and collagen

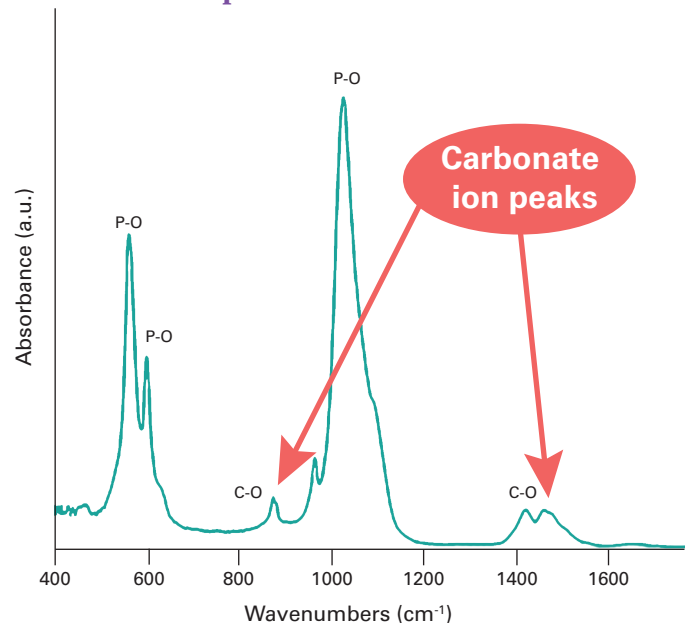


- The figure above shows the IR spectra of the human, bovine and porcine bones, hydroxyapatite and collagen.<sup>(4)</sup> It reflects the identical chemical composition of human, bovine & porcine bones. They all show a carbonate ion peak at around 871 cm<sup>-1</sup> and 1410/1445 cm<sup>-1</sup>

Our proprietary method to process bone tissue preserves the natural porous structure and maintains the carbonate apatite crystal structure.<sup>(5)</sup>

- After processing porcine bone tissue using our proprietary method, the IR of processed bone was similar to that of naturally occurring bone with carbonate band between 800 cm<sup>-1</sup> - 900 cm<sup>-1</sup> and 1400 cm<sup>-1</sup> 1500 cm<sup>-1</sup>
- The material structure of carbonate apatite being similar to the mineral structure of natural bone, supports and facilitates remodeling of the new bone

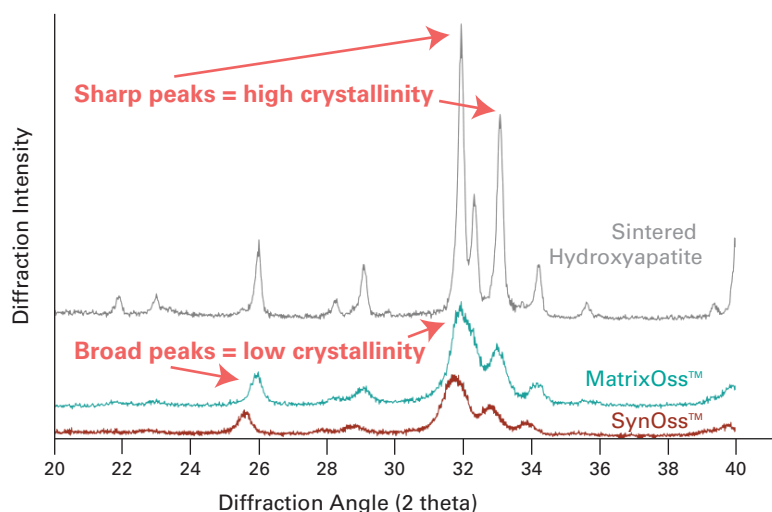
### IR Spectra for MatrixOss™



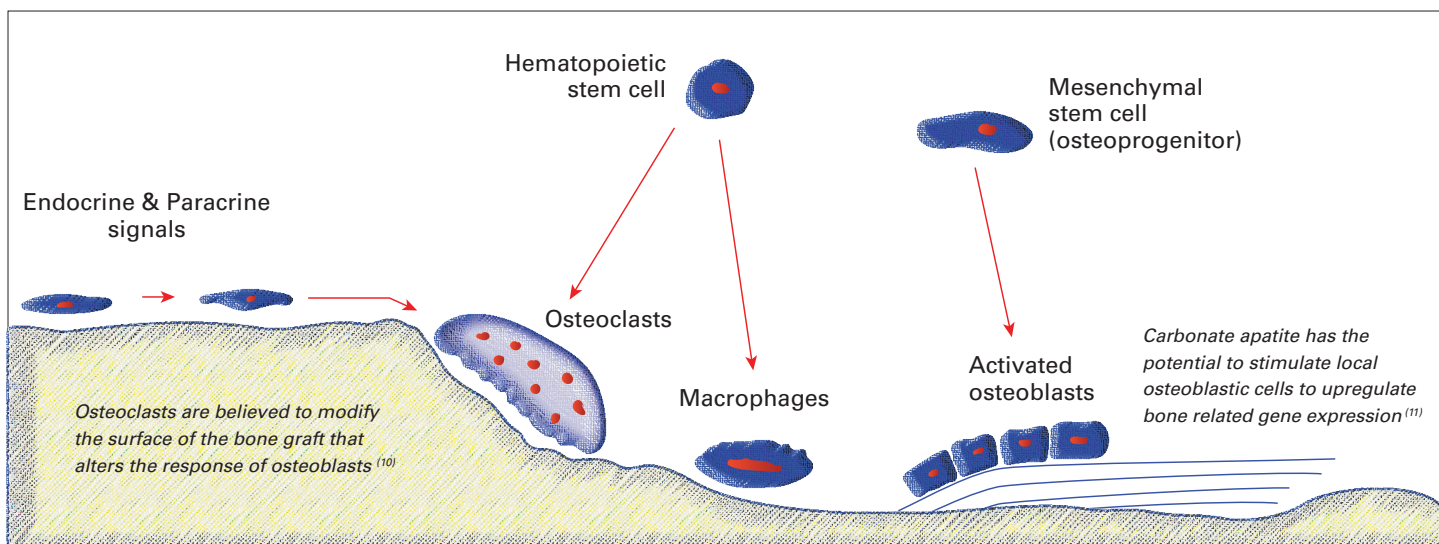
## 2 Low crystallinity supports bioresorption

- ❖ The broad spectrum of the mineral indicates a smaller crystal size. Both diffraction patterns are close to mature native bone diffraction pattern that is consistent with bone mineral of apatite nature with low crystallinity.<sup>(6)</sup> Hydroxyapatite shows characteristically narrow spectrum with sharper peaks indicative of high crystallinity.
- ❖ Carbonate substitution leads to greater bioresorption by osteoclasts due to low crystallinity of the bone graft<sup>(3,7,8)</sup>

### X-ray diffraction for MatrixOss™, SynOss™ and Hydroxyapatite



## 3 Carbonate apatite has been shown to increase the bone forming activities of **osteogenic cells** as well as enhance bioresorption of bone by **osteoclasts**<sup>(9)</sup>



- ❖ In-vivo the activities of osteoclasts and osteoblasts are closely related in a process known as coupling<sup>(10, 12, 13)</sup>
- ❖ The material structure and porosity (*or void space*) are two parameters that we have evaluated and optimized in the development of our bone graft matrices





# MatrixOss™ Granules

## ANORGANIC BONE GRAFT

MatrixOss™ Granules is an osteoconductive, porous, anorganic bone mineral with carbonate apatite structure derived from porcine cancellous bone

### Product Features:

- ❖ Carbonate apatite structure - similar to natural bone
- ❖ Highly porous
- ❖ Rough surface/faciliates cell adhesion
- ❖ High volume fill



## Why **MatrixOss™**?

### Safe

- ❖ Porcine animals are considered a non-TSE relevant species
- ❖ Bone tissue is subjected to several processing steps known to eliminate or inactivate viruses
- ❖ A rigorous process designed to effectively mitigate any risk of disease transmission and ensure safety for human implantation
- ❖ The bone graft is provided sterile and for single use only

### Carbonate apatite anorganic bone mineral

- ❖ Carbonate apatite structures are better osteoconductive materials than hydroxyapatite <sup>1,2,3</sup>
- ❖ Resorption and remodeling profiles are more similar to natural bone than those of synthetic materials, such as hydroxyapatite or tricalcium phosphate <sup>2</sup>

CATALOG NO.	VOLUME	PARTICLE SIZE RANGE
PMC0510	0.5 cc	0.25 - 1.0 mm
PMC1010	1.0 cc	0.25 - 1.0 mm
PMC2010	2.0 cc	0.25 - 1.0 mm
PMC4010	4.0 cc	0.25 - 1.0 mm
PMC1020	1.0 cc	1.0 - 2.0 mm
PMC2020	2.0 cc	1.0 - 2.0 mm

### Syringe

CATALOG NO.	VOLUME	PARTICLE SIZE RANGE
PMCS025	0.25 cc	0.25 - 1.0 mm
PMCS05	0.5 cc	0.25 - 1.0 mm



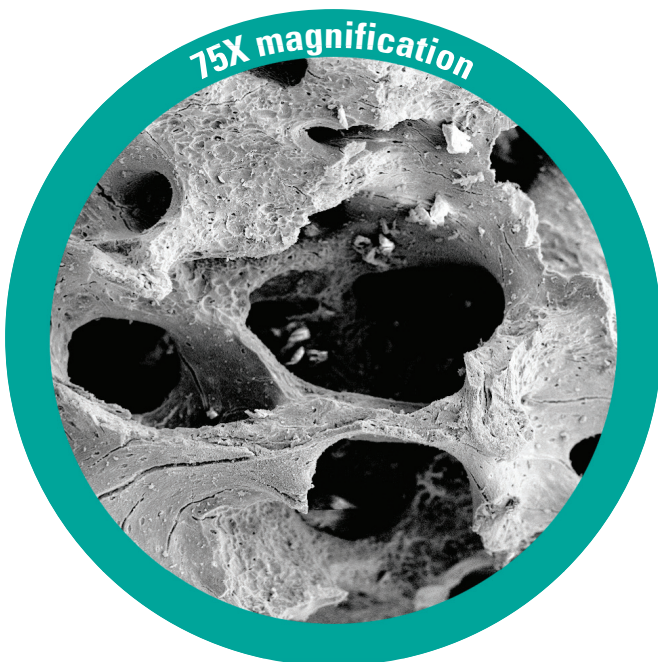
## Porous

- ❖ Porosity permits vascularization of the defect site and enhances osteogenesis<sup>14,15</sup>
- ❖ High porosity and large pores enhance bone ingrowth and osseointegration of the implant after surgery<sup>15</sup>
- ❖ MatrixOss™ macropores range between 0.1mm – 1.0mm<sup>16</sup>



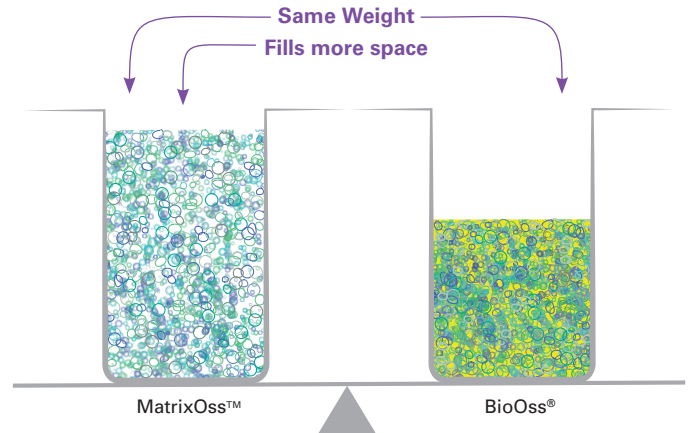
## Surface Roughness<sup>17</sup>

- ❖ Surface roughness affects cellular response, enhancing cell adhesion and proliferation and possibly other markers of expression of cell phenotype, like production of collagen type I, osteocalcin, extracellular matrix and mineralized material



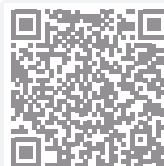
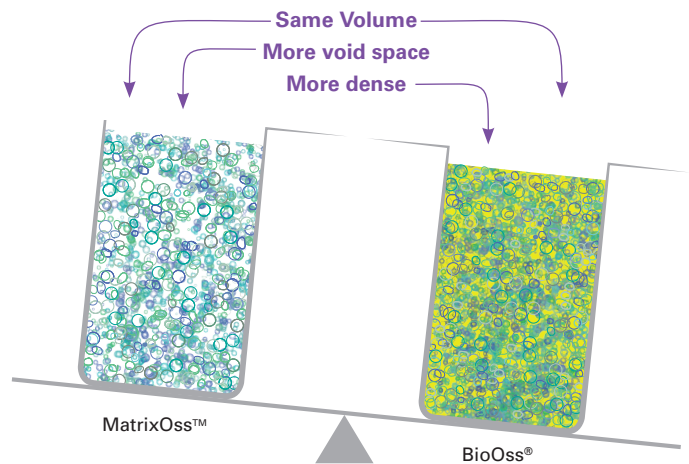
## Volume Fill<sup>16</sup>

- ❖ 1 gram of small size particles fills approximately 34% more volume than Bio-Oss®
- ❖ 1 gram of large size particles fills approximately 49% more volume than Bio-Oss®



## Void Space<sup>16</sup>

- ❖ 88% void space for porcine mineral vs. 78% void space of Bio-Oss® for small particles
- ❖ 95% void space for porcine mineral vs. 88% void space of Bio-Oss® for large particles



Scan  
here  
to view  
product demo  
video



# SynOss™ Putty

## SYNTHETIC MINERAL-COLLAGEN COMPOSITE BONE GRAFT

SynOss™ Putty is a calcium phosphate-based mineral with a carbonate apatite structure similar to natural bone combined with type I collagen derived from bovine Achilles tendon. The mineral particles are dispersed within collagen fibers forming a 3-dimensional matrix. It is supplied dry and forms a moldable putty upon hydration. It is fully resorbed during the natural process of bone formation and remodeling.

### Product Features:

- ❖ Carbonate apatite plus bovine type I collagen
- ❖ Moldable putty upon hydration
- ❖ Osteoconductive, 3 dimensional structure for forming cells
- ❖ Mineral particles are contained within the defect site

CATALOG NO.	VOLUME	SIZE
SMB050	0.5 cc	9.0mm x 8.0mm
SMB100	1.0 cc	11.0mm x 10.5mm
SMB200	2.0 cc	11.0mm x 21.0mm

Collagen holds mineral particles together in a 3D matrix



Moldable upon hydration



Scan here to view product demo video





# SynOss™ Granules

## SYNTHETIC MINERAL BONE GRAFT

SynOss™ Granules Synthetic Mineral Bone Graft is an osteoconductive calcium phosphate-based (*carbonate apatite*) bone graft material that provides clinicians and their patients with an ideal alternative to human allograft and animal origin bone graft material.

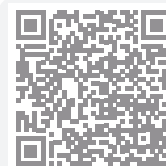
The similarity in structure between SynOss™ Granules and natural anorganic bone mineral allows the SynOss™ Granules in vivo resorption and remodeling profile to mimic that of natural bone.

### Product Features:

- ❖ Synthetic alternative to allografts and xenografts
- ❖ Carbonate apatite structure similar to natural bone mineral
- ❖ Osteoconductive



CATALOG NO.	VOLUME	PARTICLE SIZE RANGE
SM2510	0.5 cc	0.35 - 1.0 mm
SM5010	1.0 cc	0.35 - 1.0 mm
SM10010	2.0 cc	0.35 - 1.0 mm
SM20010	3.5 cc	0.35 - 1.0 mm



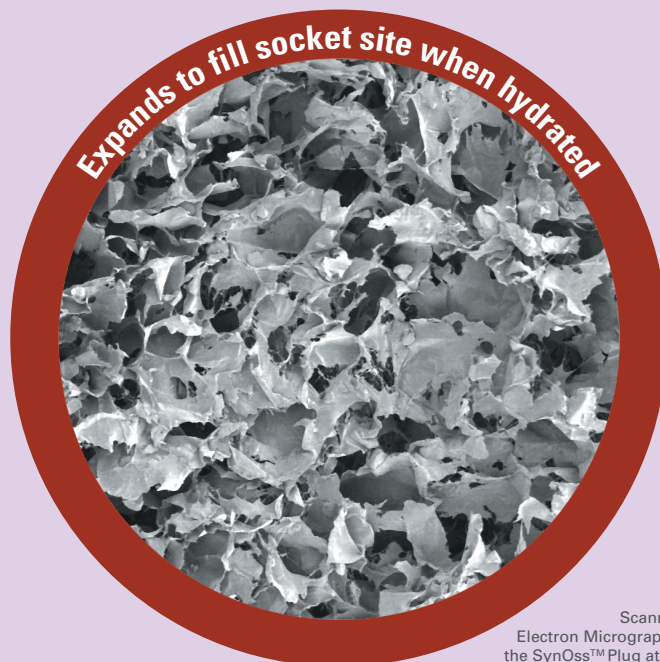
Scan here to view product demo video



# SynOss™ Plug

## BONE GRAFT COMPOSITE PLUG

SynOss™ is a calcium phosphate-based mineral with a synthetic carbonate apatite structure which is like natural bone. The similarity in structure between the SynOss™ mineral and natural anorganic bone mineral mimics natural bone as shown in vivo resorption and remodeling profile. The low crystallinity of carbonate apatite supports bioresorption and the synthetic mineral has been shown to increase the bone forming activities of osteogenic cells as well as enhance bioresorption of bone by osteoclasts. The makeup of the SynOss™ Plug is approximately 80% mineral combined with 20% Type I Achilles bovine tendon collagen.



Scanning  
Electron Micrograph of  
the SynOss™ Plug at 50x  
magnification

### Product Features:

- ❖ Ease of use for socket sites treated with composite plug
- ❖ Expands to fill socket site when hydrated
- ❖ Mineral particles are contained within the defect site
- ❖ Offered in two sizes conveniently packaged five per box

CATALOG NO.	SIZE	5 PER BOX
SMCP1020	10mm x 20mm	5 per box
SMCP0625	6mm x 25mm	5 per box



Scan  
here  
to view  
product demo  
video



# MatrixDerm® Tape, Foam and Plug

## RESORBABLE WOUND DRESSING



MatrixDerm® Resorbable Wound Dressings are absorbent, porous, collagen matrices engineered from purified collagen derived from bovine dermis tissue.

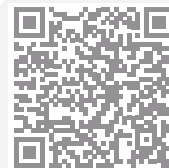
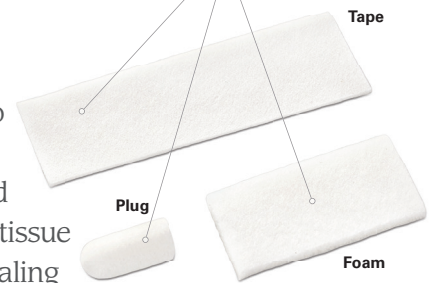
They are indicated for use for denture sores, oral ulcers (*non-infected or viral*), periodontal surgical wounds, suture sites, burns, extraction sites, surgical wounds and traumatic wounds.

CATALOG NO.	SIZE * Length x Width x Height
BDDWDT2575	2.5 cm x 7.5 cm x 1mm -Tape
BDDWDF2040	2.0 cm x 4.0 cm x 3.0 mm - Foam
BDDWDP1020	10 mm x 20 mm - Plug

\* Quantities of 10

### Product Features:

- ❖ Applied directly to the wound and protect the wound and delicate new tissue
- ❖ Aids in wound healing
- ❖ Available in tape, foam and plug form
- ❖ Supplied sterile, non-pyrogenic and for single use only
- ❖ Essentially resorbs within 30 days of placement



Scan here to view product demo video

# Collatene™

## MICROFIBRILLAR COLLAGEN WOUND DRESSING

Collatene™ Microfibrillar Collagen is an absorbent microfibrillar collagen matrix intended for the management of oral wounds and sores. It forms a gel when mixing with the wound's exudate and oral fluid to provide a moist healing environment.

It is indicated for use for denture sores, oral ulcers (*non-infected or viral*), periodontal surgical wounds, suture sites, burns, extraction sites, surgical wounds and traumatic wounds.

### Product Features:

- ❖ Highly purified bovine type I collagen
- ❖ Applied directly to the wound and protects the wound bed and delicate new tissue
- ❖ Resorbable
- ❖ Collatene is supplied sterile, in individual vials and for single-use only
- ❖ Controls minor bleeding due to intrinsic hemostatic properties of intact collagen fibers



CATALOG NO.	VOLUME	QUANTITY
DWDG0010	0.1 gram	15 vials/box



Scan here to view product demo video



## References:

1. Spense G., Patel N., Brooks R., Rushton N. 2010. Osteoclastogenesis on hydroxyapatite ceramics: The effect of carbonate substitution. J Biomed Mater Res A. 2010 Mar 15;92(4):1292-300.
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