**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.

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**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

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**Evolution of Dental Products**

- **In the Beginning**
  - 1997

- **1st Bovine Dental Membrane**
  - 2001

- **Bovine Bone Graft**
  - 2004

- **Bovine Composite Bone Graft**
  - 2005

- **Porcine Bone Graft**
  - 2007

- **1st Porcine Dental Membrane**
  - 2011

- **Porcine Bone Graft**
  - 2014

- **Full Line of Porcine Products Launched**
  - 2016
Our products have helped patients worldwide with over 7.5 million medical devices that have been produced across all five key business units.

7.5 million

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.

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

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

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
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

<table>
<thead>
<tr>
<th>CATALOG NO.</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDMPP1520</td>
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</tr>
<tr>
<td>CDMPP3040</td>
<td>30mm x 40mm</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>CATALOG NO.</th>
<th>SIZE</th>
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</thead>
<tbody>
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<td>20mm x 30mm</td>
</tr>
<tr>
<td>PDM3040</td>
<td>30mm x 40mm</td>
</tr>
</tbody>
</table>
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

<table>
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<tr>
<td>CMPT3040</td>
<td>30mm x 40mm</td>
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MatrixDerm® EXT
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

<table>
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<tr>
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<td>20mm x 30mm</td>
</tr>
<tr>
<td>PDMX3040</td>
<td>30mm x 40mm</td>
</tr>
</tbody>
</table>

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

Scan here to view product demo video
MatrixDerm® Cap

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

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

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

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.(1,2,3)

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

- 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⁻¹ - 900 cm⁻¹ and 1400 cm⁻¹ 1500 cm⁻¹.

- 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™

Our proprietary method to process bone tissue preserves the natural porous structure and maintains the carbonate apatite crystal structure.(5)
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.\(^6\) 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.\(^{3,7,8}\)

Carbonate apatite has been shown to increase the bone forming activities of osteogenic cells as well as enhance bioresorption of bone by osteoclasts.\(^8\)

- In-vivo the activities of osteoclasts and osteoblasts are closely related in a process known as coupling.\(^{10,12,13}\)
- 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/facilitates 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
- Resorption and remodeling profiles are more similar to natural bone than those of synthetic materials, such as hydroxyapatite or tricalcium phosphate

<table>
<thead>
<tr>
<th>CATALOG NO.</th>
<th>VOLUME</th>
<th>PARTICLE SIZE RANGE</th>
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<tbody>
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<td>0.25 - 1.0 mm</td>
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<tr>
<td>PMC1010</td>
<td>1.0 cc</td>
<td>0.25 - 1.0 mm</td>
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<tr>
<td>PMC2010</td>
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<td>0.25 - 1.0 mm</td>
</tr>
<tr>
<td>PMC4010</td>
<td>4.0 cc</td>
<td>0.25 - 1.0 mm</td>
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<tr>
<td>PMC1020</td>
<td>1.0 cc</td>
<td>1.0 - 2.0 mm</td>
</tr>
<tr>
<td>PMC2020</td>
<td>2.0 cc</td>
<td>1.0 - 2.0 mm</td>
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Syringe

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<th>PARTICLE SIZE RANGE</th>
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<tbody>
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<td>PMCS025</td>
<td>0.25 cc</td>
<td>0.25 - 1.0 mm</td>
</tr>
<tr>
<td>PMCS05</td>
<td>0.5 cc</td>
<td>0.25 - 1.0 mm</td>
</tr>
</tbody>
</table>
Porous

- Porosity permits vascularization of the defect site and enhances osteogenesis.\(^{14,15}\)
- High porosity and large pores enhance bone ingrowth and osseointegration of the implant after surgery.\(^{15}\)
- MatrixOss™ macropores range between 0.1mm – 1.0mm.\(^{16}\)

Surface Roughness\(^{17}\)

- 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\(^{16}\)

- 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\(^{16}\)

- 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.

75X magnification of MatrixOss™ and Bio-Oss®.
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

<table>
<thead>
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<th>CATALOG NO.</th>
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<th>SIZE</th>
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<tbody>
<tr>
<td>SMB050</td>
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<td>9.0mm x 8.0mm</td>
</tr>
<tr>
<td>SMB100</td>
<td>1.0 cc</td>
<td>11.0mm x 10.5mm</td>
</tr>
<tr>
<td>SMB200</td>
<td>2.0 cc</td>
<td>11.0mm x 21.0mm</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>CATALOG NO.</th>
<th>VOLUME</th>
<th>PARTICLE SIZE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM2510</td>
<td>0.5 cc</td>
<td>0.35 - 1.0 mm</td>
</tr>
<tr>
<td>SM5010</td>
<td>1.0 cc</td>
<td>0.35 - 1.0 mm</td>
</tr>
<tr>
<td>SM10010</td>
<td>2.0 cc</td>
<td>0.35 - 1.0 mm</td>
</tr>
<tr>
<td>SM20010</td>
<td>3.5 cc</td>
<td>0.35 - 1.0 mm</td>
</tr>
</tbody>
</table>
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.

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

<table>
<thead>
<tr>
<th>CATALOG NO.</th>
<th>SIZE</th>
<th>5 PER BOX</th>
</tr>
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<tbody>
<tr>
<td>SMCP1020</td>
<td>10mm x 20mm</td>
<td>5 per box</td>
</tr>
<tr>
<td>SMCP0625</td>
<td>6mm x 25mm</td>
<td>5 per box</td>
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</table>
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.

### 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

<table>
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<tr>
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<th>SIZE * Length x Width x Height</th>
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<tbody>
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<td>BDDWDT2575</td>
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<tr>
<td>BDDWDF2040</td>
<td>2.0 cm x 4.0 cm x 3.0 mm - Foam</td>
</tr>
<tr>
<td>BDDWDP1020</td>
<td>10 mm x 20 mm - Plug</td>
</tr>
</tbody>
</table>

* Quantities of 10

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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

<table>
<thead>
<tr>
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<th>VOLUME</th>
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<tbody>
<tr>
<td>DWDG0010</td>
<td>0.1 gram</td>
<td>15 vials/box</td>
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</table>
References:


16. Data on file


MatrixFlex®, MatrixDerm®, MatrixMem®, MatrixDerm® EXT MatrixDerm® Cap, MatrixOss® Granules, MatrixOss™ Syringe, SynOss™ Putty, SynOss™ Granules, SynOss™ Plug MatrixDerm® Tape, MatrixDerm® Foam, MatrixDerm® Plug and Collatene® are all trademarks of and manufactured by Collagen Matrix, Inc. Bio-Oss® is a registered trademark of Geistlich-Pharma, Switzerland. Please refer to the Instructions for Use for description, indications, contraindications, warnings, precautions and other important information. A surgeon must always rely on his or her own professional clinical judgement when deciding whether to use a particular product when treating a particular patient. Availability of these products might vary from one given country or region to another as a result of specific local regulatory approval or clearance requirements for sale in such country or region.