Geistlich
Surgery

Orthoss®
Orthoss® Collagen

The Surgeon's Choice for Bone Regeneration

swiss made

As Close to Human Bone as Possible

Orthoss® is an apatite similar to the structure of the mineral phase of human bone. It is derived from highly purified bovine bone and is produced in Switzerland, following a rigorous quality assurance system to ensure its safety and quality. The Orthoss® bone graft substitute, as a result of Geistlich's proprietary processing, features a unique pore structure consisting of both micropores and macropores. Each act as conduits for the necessary elements needed for bone regrowth – including blood.

The fiber-like structure of the surface demonstrates the advantages of the Geistlich purification process. The intricate and naturally formed surface and porous structure is preserved in processing while all organic material is removed. When exposed to fluids this pristine surface supports the quick uptake of proteins.

In a comparative study, Orthoss® was shown to have the highest protein absorption capacity of eight bone substitutes.[1]

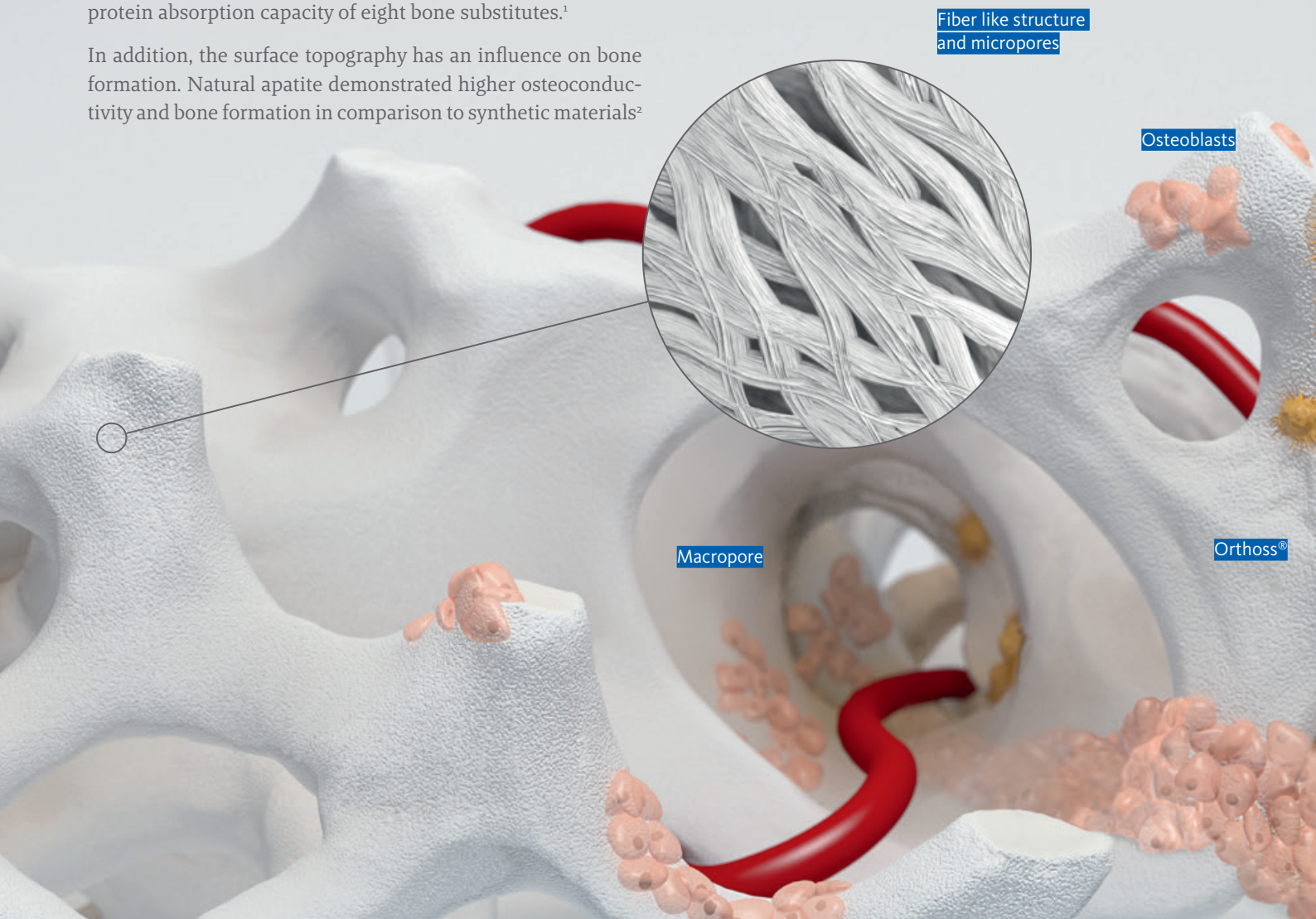
In addition, the surface topography has an influence on bone formation. Natural apatite demonstrated higher osteoconductivity and bone formation in comparison to synthetic materials[2]

Micropores

The presence and interconnectivity of a large number of micropores (10–20 nm) causes the high capillarity of Orthoss® and contributes to its high wettability.[3] Embedded in the walls of the macropores, they enable Orthoss® to spontaneously take up and retain a large volume of blood and other fluids.

Macropores

Macropores (100–300 µm) enable the movement and adhesion of bonebuilding cells throughout the Orthoss® scaffolding. They provide the space for blood vessels to grow into and for communities of cells to grow.[3]



Interconnectivity

Orthoss® provides a network of interconnected pores, which act as conduits for all the necessary elements for bone regrowth, such as blood.[3] This network enables the rapid absorption of blood, promotes revitalization through new blood vessels, and enables the guided growth of new bone.

Colonization

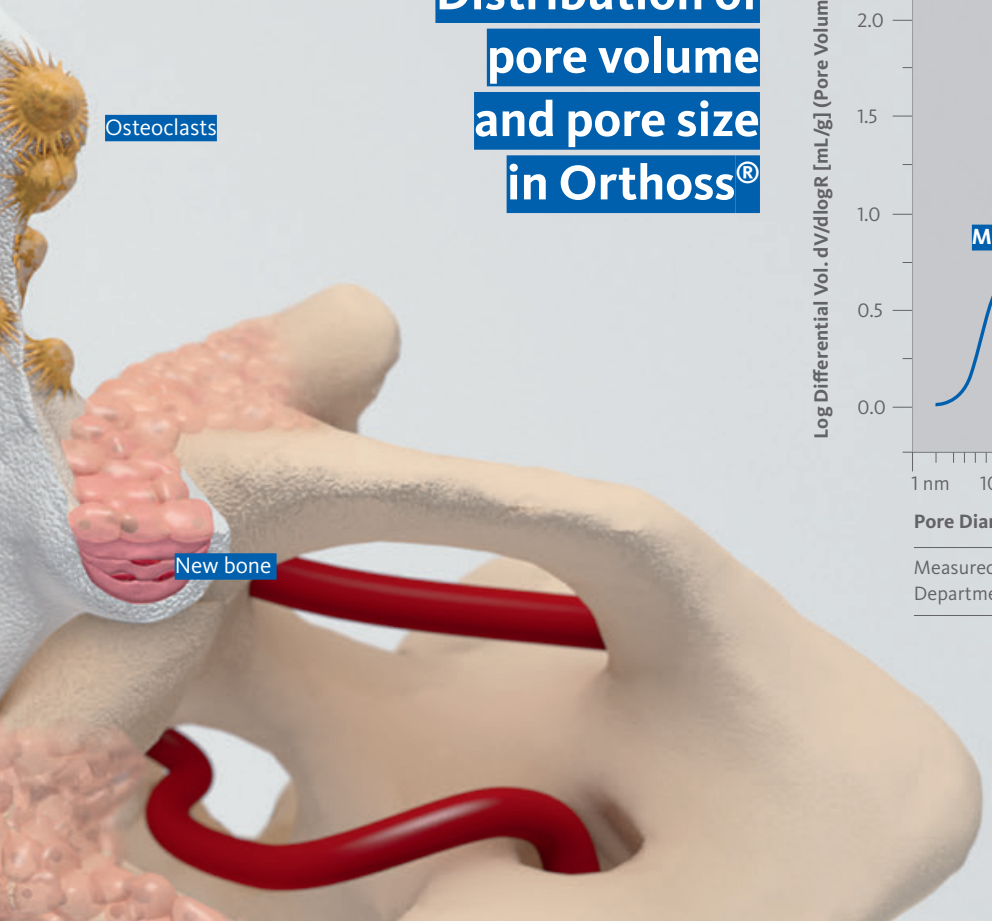
Immediately after the surgery, cells enter the interconnected network of pores, where they can attach, proliferate, and differentiate.[4]

Integration

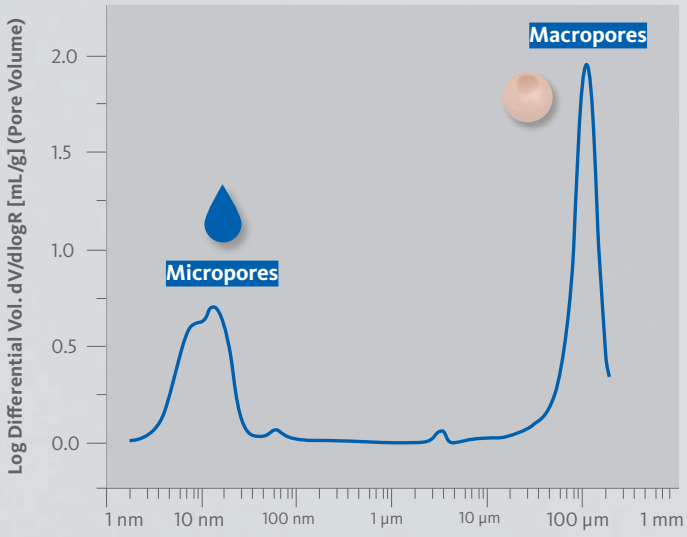
After surgery, Orthoss® behaves very similarly to human bone as it becomes incorporated into the surrounding bone.[5] Its exceptional osseointegration is due to its unique bimodal pore structure of micro- and macropores, which promotes healing by fostering the formation of new blood vessels and new bone tissue.

Remodelling

In the following months and years, the balance between the rate of resorption of the bone graft material and the rate of bone tissue formation is key.[6] Orthoss® resorbs slowly, providing a stable scaffolding that preserves the volume of the repaired area while the new bone tissue grows. The Orthoss® scaffolding stays in place until the new bone is ready to take its place. The outcome is a long-lasting repair that remains stable and strong over the long term.



Distribution of pore volume and pore size in Orthoss®



Measured with Mercury Intrusion Porosimetry: Research Analysis Department, Geistlich Pharma AG, Wolhusen, Switzerland, 2006

Orthoss® has a unique pore structure very similar to human bone, which provides the ideal conditions for bone regeneration.

Orthoss® Bone Graft Substitute

Backed by 25+ years of clinical experience, the Orthoss® bone graft substitute offers the osteoconductive properties of human bone in a convenient, off the shelf configuration.[7,8]

The product was designed in collaboration with surgeons and has an extensive global history demonstrating safety of material in orthopedic and dental indications.

Geistlich Orthoss® has been used in a variety of orthopedic applications and features an optimized structure that supports bone regeneration.

Orthoss® is available in blocks and granules.

Orthoss® granules

Orthoss® Block

Ask your Orthoss® representative for more information on choosing the best delivery format for your needs.

Dedicated to Regeneration

Geistlich is a family owned Swiss company with a 160-year history of processing materials into a variety of different products. In the 1980's, Geistlich Pharma AG entered the field of medical biomaterials and has firmly established itself as the world leader in bone and soft tissue regenerative dentistry.

Building from this global leadership position, Geistlich Surgery, the company's business unit focused on orthopedic applications, offers bio-derived cell-free products for bone and cartilage, including Orthoss®, Orthoss® Collagen, and Chondro-Gide®.

The key to Geistlich's success in producing state of the art biomaterials is their proprietary manufacturing process. The process carefully preserves the structure of delicate materials such as apatite, thus preserving osteoconductive characteristics. The process also allows for careful configuration of the material in order to meet the relevant indication.

From structure to manufacturing, the slightest differences in material can have a significant impact on clinical results. Our biomaterials experts understand how to best design and create a product to meet surgeons' and patients' needs. The result is a bioderived apatite scaffold with a chemical and structural composition very similar to human bone mineral.

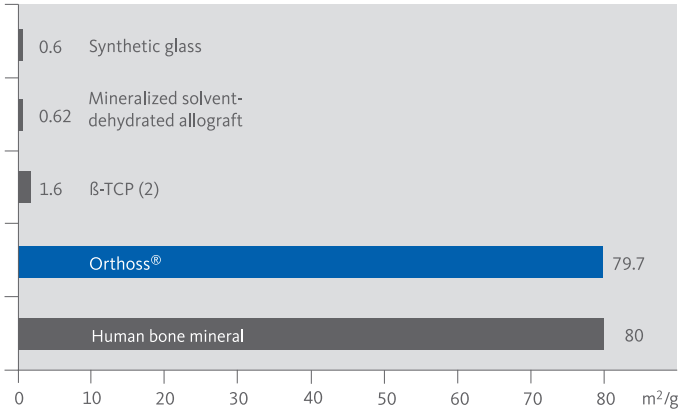
All Bone Substitutes are Not Equal

To repair bone defects, human bone grafts are still widely considered the gold standard. But with both autografts and allografts, there are several known risks and disadvantages. These include the risk of disease transmission, donor site pain, and the limited availability or quality of material.[9, 10]

To ensure the quality and safety of a procedure, a bone substitute may be preferable.

The table below compares Orthoss® with the other main types of bone substitutes currently used.[3]

The interconnected pore system and high porosity of Orthoss® results in an inner surface area which is significantly larger than other available bone graft substitutes and is similar to that of autologous bone mineral.[3]



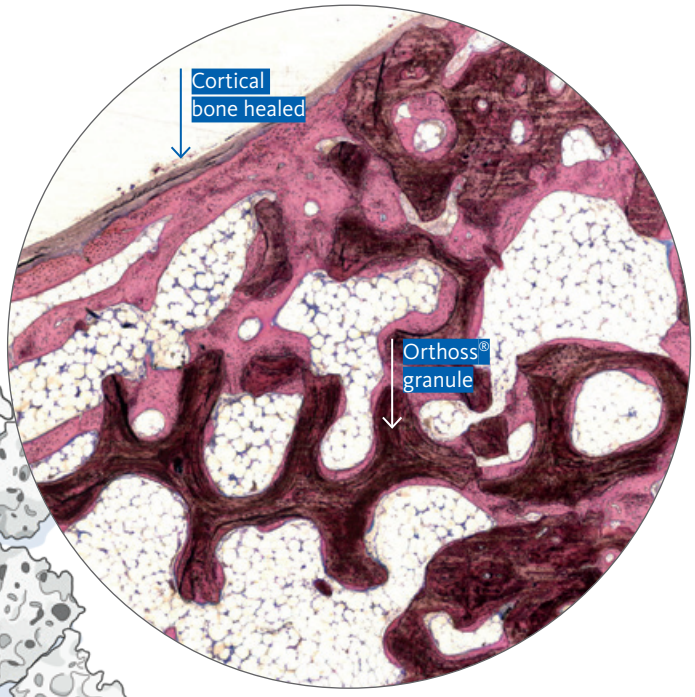
Specific (inner) surface area measured with gas adsorption of commercial bone graft substitute materials compared to Orthoss® and autologous bone mineral.[3]

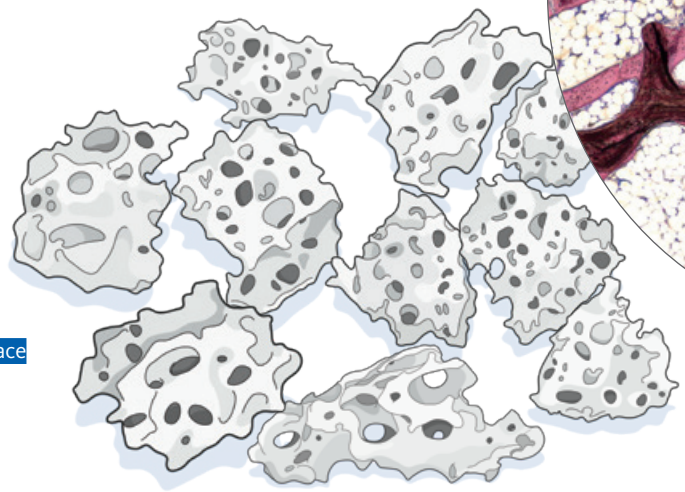
	Micropores and Capillarity	Macropore Interconnectivity and Surface Area	Penetration of New Bone throughout Scaffold
Orthoss®	Capillarity similar to human bone.	Interconnectivity and surface area similar to human bone.	Complete penetration due to interconnectivity and volume-preserving scaffold.
Partially Purified Natural Bone	Partially blocked by organic material.	Pores partially blocked by organic material. Considerably smaller surface area (50x smaller) compared to human bone.	Limited due to organic residues in structure.
Sintered Natural Bone	No micropores.	Pores partially blocked by sintering process. 100x smaller surface area in comparison to human bone.	Almost absent due to low interconnectivity.
Synthetic ß-TCP	No micropores.	Low interconnectivity and 50x smaller surface area compared to human bone.	Limited due to low interconnectivity. Rapid dissolution of scaffold.
Synthetic Hydroxyapatite	No micropores.	Almost absent due to low interconnectivity. >100x smaller surface area compared to human bone.	Limited due to low interconnectivity.

Orthoss® integration and remodeling studies

Following implantation, the inter-granular space works in conjunction with the host bone by creating an environment where new blood vessels and bone tissue can form.

In the months following implantation, the balance between the rate of resorption of Orthoss® and the rate of bone tissue formation is critical. Orthoss® resorbs slowly, providing a stable scaffolding that preserves the volume of the repaired area while the new bone tissue incorporates.

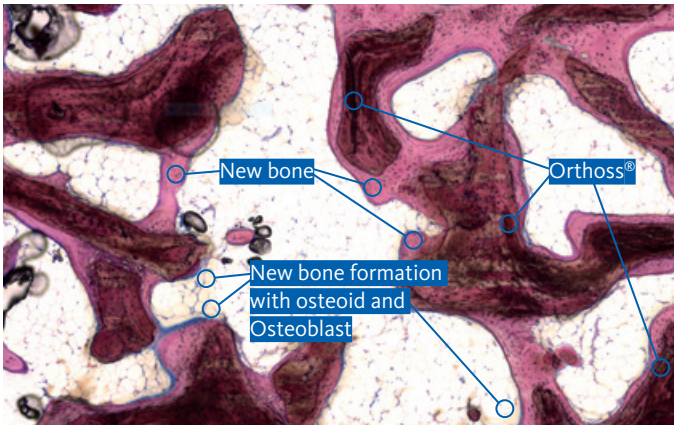




White New Zealand Rabbit femoral condyle defect at 12 weeks

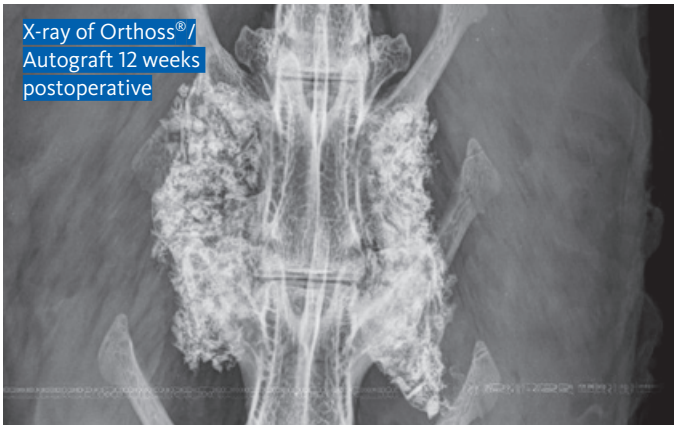
Orthoss® has been evaluated for osteoconductivity and supporting new bone formation in a rabbit critical size femoral condyle defect.

A marked bone neoformation and fully healed cortical bone in the majority of cases was observed in the defects at 12 weeks post implantation. The granules of Orthoss® supported osteoconduction and osteointegration with a significantly lower formation of fibrous tissue as compared to synthetic bone graft substitutes.[3]



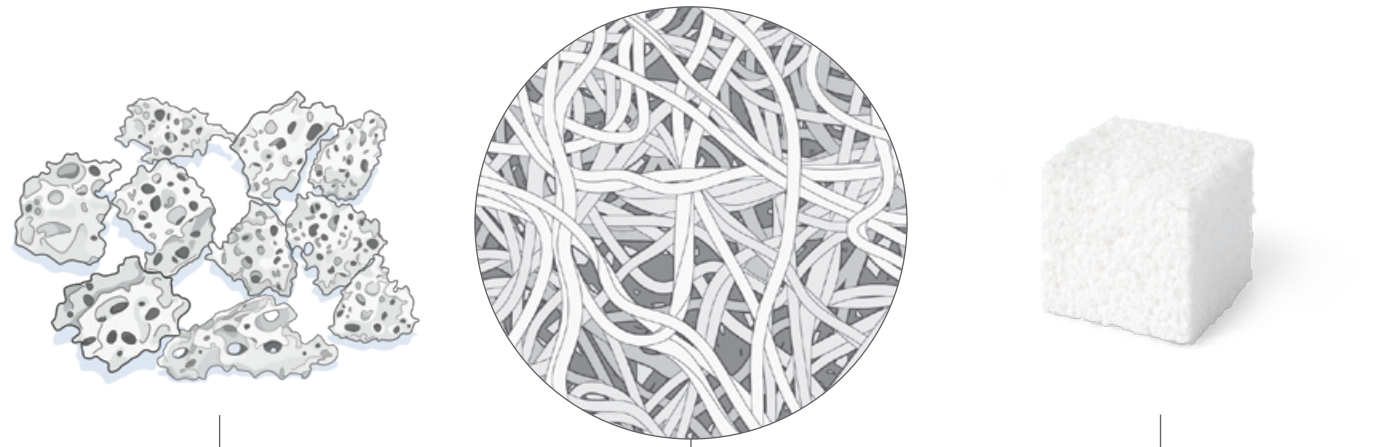
Posterolateral intertransverse process fusion in Boden rabbit model

Orthoss®, combined with autograft at a ratio of 1:1 was implanted into a single level, bilateral posterolateral spine fusion model in a rabbit. At 9 weeks, radiographic fusion was similar to the control group, which consisted of autograft alone. Similarly, there was no difference observed between the Orthoss®/autograft group and the autograft control group in manual palpation at 9 and 12 weeks post implantation.[3]



Orthoss® Collagen

Orthoss® Collagen is a highly purified natural bone mineral combined with native collagen, designed for orthopedic bone regeneration. Granules of cancellous bone mineral provide an osteoconductive matrix for bone regeneration. Natural collagen makes this composite material malleable.



Orthoss® spontaneously wettable & osteoconductive

+

Collagen enhances cellular adhesion and handling properties[9]

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Orthoss® Collagen: Composite material for bone regeneration with optimized handling characteristics[3]

Performance in bone regeneration

The Orthoss® Collagen composite material is characterized by a bimodal pore structure of microsize and macrosize pores with high interconnectivity[3]. Together they provide Orthoss® Collagen with a large surface area, comparable to human bone, as well as the capacity for complete wettability and fluid storage.[3] While the collagen part of the material is resorbed within weeks, the slow resorption rate of the mineral scaffold provides a protective environment and volume maintenance during bone ingrowth.[11,12]

The large inner surface also results in exceptional osteoconductivity and osseointegration. The biofunctionality of the natural material further enhances bone ingrowth and vascularisation.[7,8,13,14]

Orthoss® Collagen must be used wet. Do not use more than three blocks.

Always pre-wet with sterile and not-pyrogenic saline before use.

Remove excess saline

Add blood and/or bone marrow

Geistlich
Surgery

More details about our distribution partners:
www.geistlich-surgery.com

Manufacturer
Geistlich Pharma AG
Business Unit Surgery
Bahnhofstrasse 40
6110 Wolhusen, Schweiz
Phone +41 41 492 55 55
Fax +41 41 492 67 35
www.geistlich-surgery.com

Affiliate Germany
Geistlich Biomaterials
Vertriebsgesellschaft mbH
Schneidweg 5
76534 Baden-Baden, Deutschland
Phone +49 72 23 96 24 0
Fax +49 72 23 96 24 10
surgery@geistlich.de
www.geistlich.de

Affiliate France
Geistlich Pharma France SA
Parc des Reflets
165 avenue du Bois de la Pie – BP 43073
95913 Roissy CDG Cedex, France
Phone +33 1 48 63 90 26
Fax +33 1 48 63 90 27
surgery@geistlich.com
www.geistlich.fr

Affiliate Italy
Geistlich Biomaterials Italia S.r.l.
Via Castelletto, 28
36016 Thiene VI, Italia
Phone +39 0445 37 08 90
Fax +39 0445 37 04 33
surgery@geistlich.com
www.geistlich.it

Affiliate Brazil
Geistlich Pharma do Brasil
Av. Brig. Faria Lima
1461 – 13 andar – cj. 131/134
01452-002 São Paulo, SP, Brasil
Tel. +55 11 3097 25 55
Fax +55 11 3097 25 50
info@geistlich.com.br
www.geistlich.com.br

Orthoss® 3g
Spongiosa granules
2–4 mm (ca. 8 cm³)

Orthoss® 5g
Spongiosa granules
1–2 mm (ca. 13 cm³)

Orthoss® 7g
Spongiosa granules
2–4 mm (ca. 20 cm³)

Orthoss® Block
1 x 1 x 2 cm

Orthoss® Block
2 x 2 x 1.3 cm

Orthoss® Collagen Block 1 x 1 x 0.8 cm

To start using Orthoss®, contact your local Geistlich representative.

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