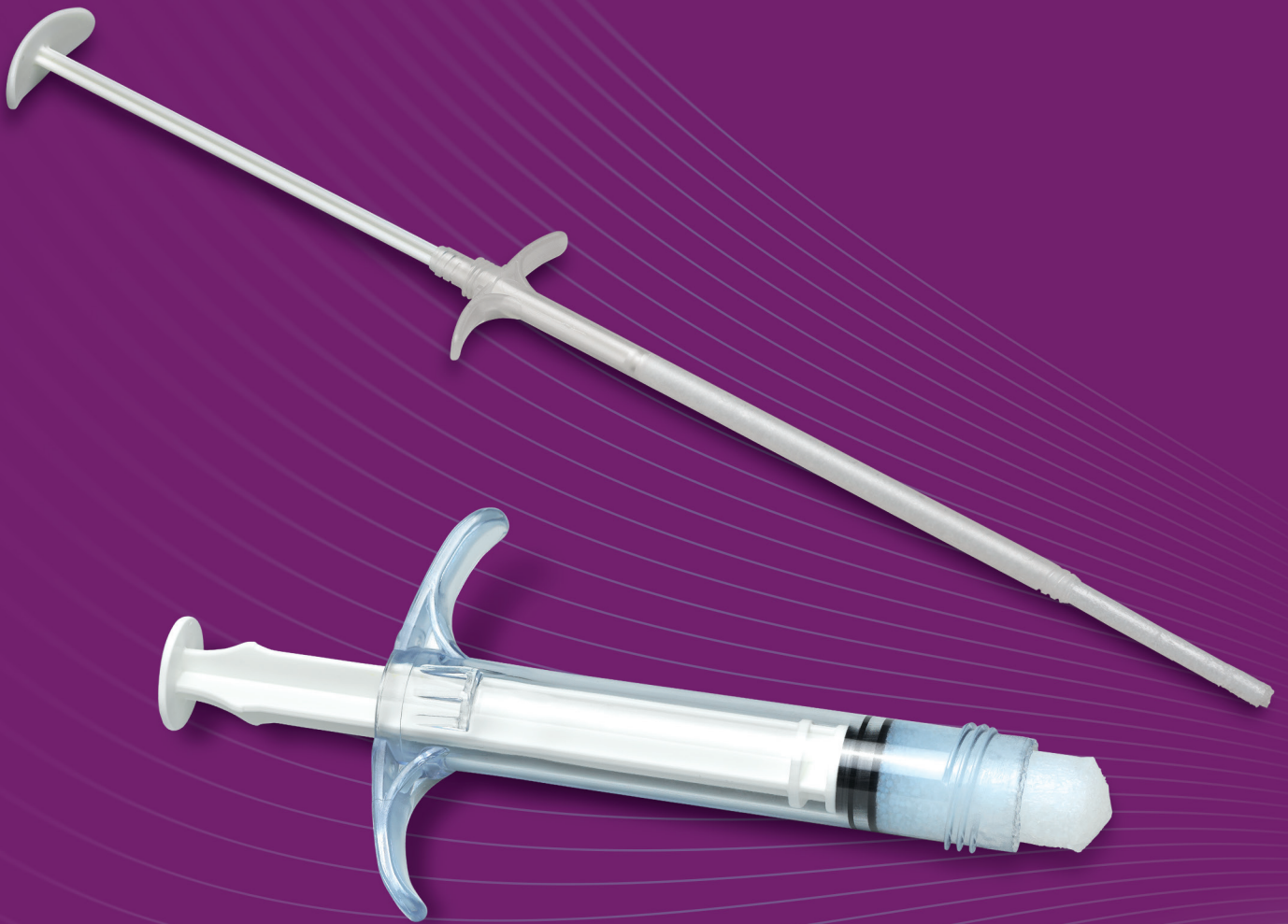


NanoBone[®]

POWER TO REMODEL RAPIDLY



NanoBone can be placed in wet or dry sites and can be used in a variety of orthopaedic surgeries and in intervertebral body fusion^{1,2}

Ideal properties of bone graft

Easy to
prepare and
apply

Rapid and
reliable bone
formation

Completely
absorbs

NanoBone®

Perfect partner for remodeling bone defects rapidly

Reliable and convenient, NanoBone is a next generation, fully synthetic bone graft substitute.

Consisting of nanostructured hydroxyapatite (HA) embedded in a silica gel matrix - suspended in a hydrogel/polymer silica carrier - it provides the fullest support for bone regeneration at every stage of the healing process.

- ✓ Comparable healing rate to autograft without the costs and complications of harvesting²
- ✓ Rapid absorption and reliable bone fusion^{2,3}
- ✓ Early osteogenesis - silica matrix exchanged for autologous proteins within 10 days⁴
- ✓ Patented nanostructure and optimized composition¹
- ✓ Preloaded, versatile and ready-to-use¹



Posterolateral spine | Interbody spinal fusion | Depressed tibial plateau fracture | Radial fracture
Pathologic fracture | Pseudarthrosis | Acetabulum reconstruction | Displacement osteotomy | Bone necrosis
Defect fill after tumor or cyst removal

Patented nanostructure and optimized composition

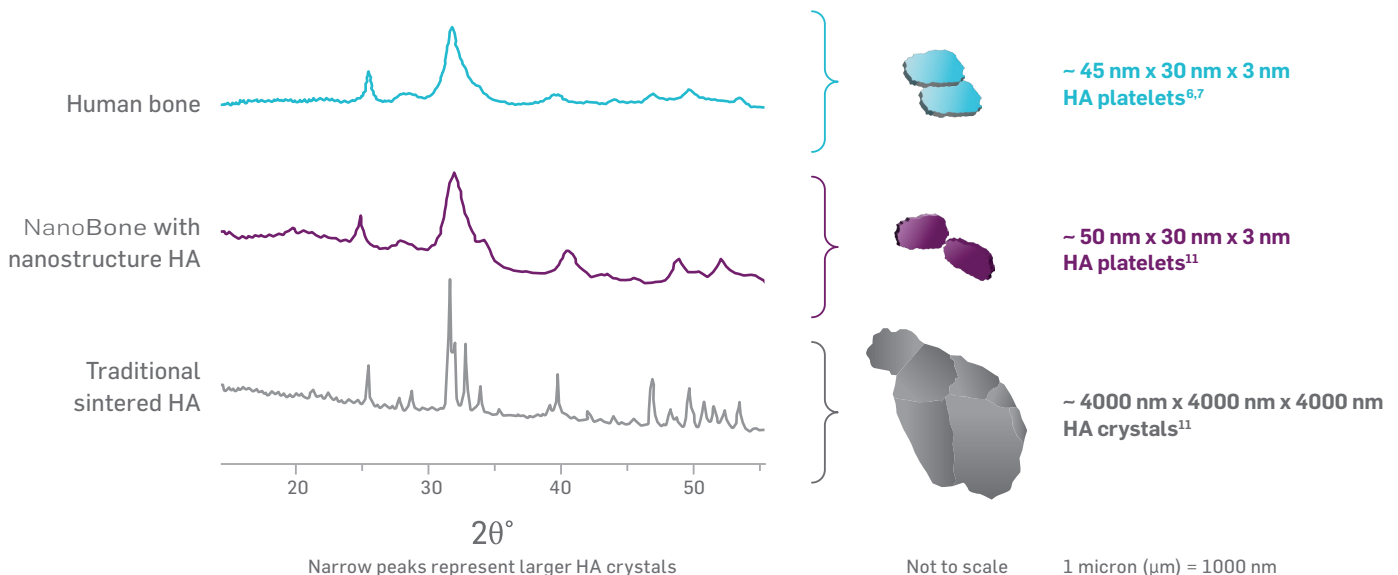
Unlike traditional synthetic HA scaffolds, the HA in NanoBone is precipitated and unsintered to preserve its highly porous and permeable nanoarchitecture and degradation properties. When combined with the high porosity silica gel matrix, NanoBone offers distinct design properties for successful bone healing.⁵

- Nanostructure of HA platelets is identical in morphology to HA in bone^{6,7,8}
- Nanostructure increases autologous protein enrichment^{4,9}
- Rapid absorption and reliable bone fusion^{2,3}

Nanostructure of HA platelets is identical in morphology to HA in bone

NanoBone is precipitated to achieve a HA morphology that mimics the HA in natural bone and ensures that complete natural bone remodeling takes place. Traditional sintered HA consists of larger connected crystals, which lower porosity and its ability to degrade.^{10,11}

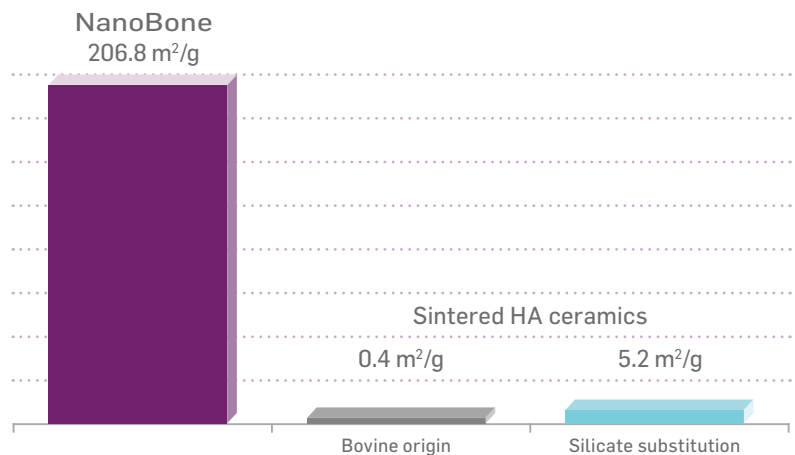
HA diffraction patterns⁸



Nanostructure increases autologous protein enrichment

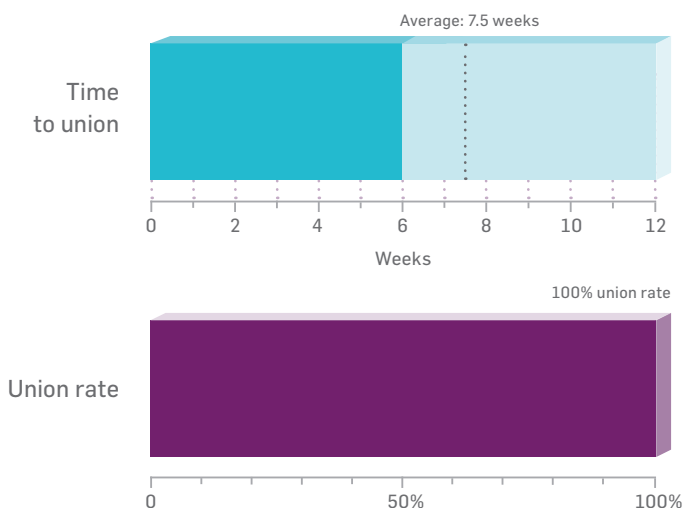
High inner surface area is key to biological efficiency. Increasing the interaction between NanoBone and serum increases autologous protein enrichment and formation of an extracellular matrix to start bone healing.^{4,9,11}

Specific surface area^{9,11,12}

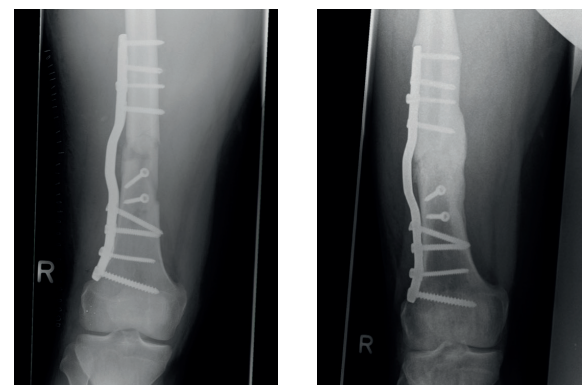


Rapid absorption and reliable bone fusion

Nanocrystalline HA particles contained in a silica gel matrix may be an alternative to autologous bone grafting, offering low complication rates, high union rates, and early healing.³



Full bone consolidation at 12 months and patient fully mobile.¹³



Post-operative

12 months

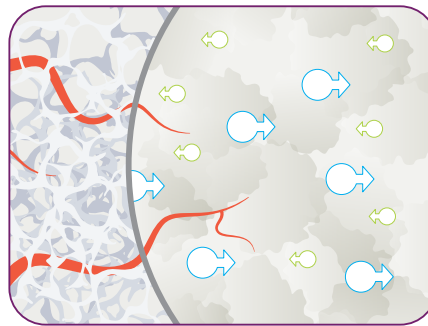
Reliable, early osteogenesis and bone formation

Bone healing is a multi-dimensional process. The silica gel matrix in NanoBone is quickly transformed by the body into a biomimetic organic matrix that enables physiological bone turnover at a very early stage.^{4,10}

Phase 1 approx. 10 days

Neovascularization of the defect and attraction of autologous proteins

Silica from the carrier and the granules is released to accelerate neovascularization and is then exchanged for an organic matrix of autologous proteins: inc. BMPs, osteocalcin, osteopontin, glycoproteins.^{4,10,14}

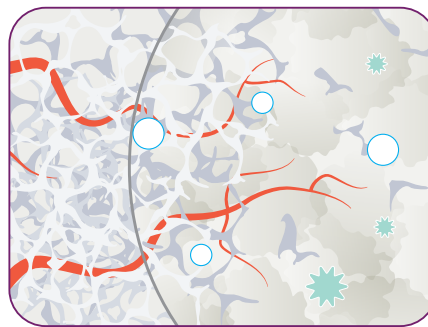


-  NanoBone
-  Vasculature
-  Autologous protein migration through NanoBone
-  Silica molecules released from NanoBone

Phase 2 approx. 100 days

Remodeling – absorption of nanostructured hydroxyapatite and proteins

Combination of nanostructured hydroxyapatite and organic matrix of autologous proteins promotes rapid bone remodeling and formation of woven bone.^{4,10,14}

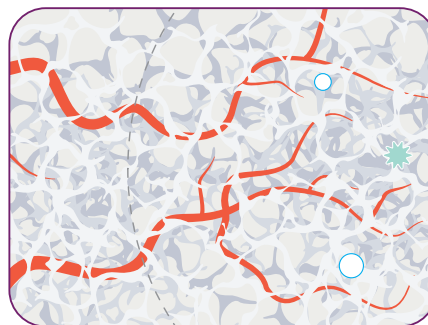


-  Woven bone
-  Vasculature
-  Osteoblasts form woven bone
-  Osteoclasts degrade biomaterial

Phase 3 beyond 100 days

Completion – absorption of woven bone and formation of lamellar bone

Remaining nanostructured hydroxyapatite and organic matrix of autologous proteins are biodegraded by osteoclasts, and osteoblasts form new lamellar bone.^{10,14}



-  Lamellar bone
-  Vasculature
-  Osteoblasts form lamellar bone
-  Osteoclasts absorb woven bone

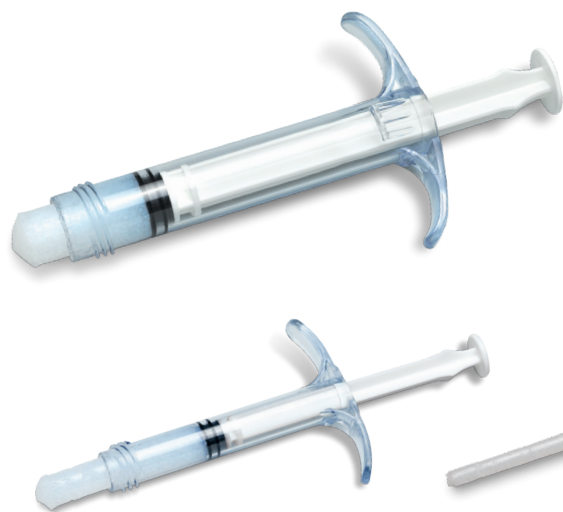
Save procedure time and resource

NanoBone is preloaded and ready-to-use in a wide variety of applications to maximize flexibility and efficiency during procedures.

- ✓ No mixing or preparation time needed
- ✓ Versatile, ergonomic handling and placement
- ✓ Maintains shape when molded and adheres to surfaces

NanoBone SBX Putty

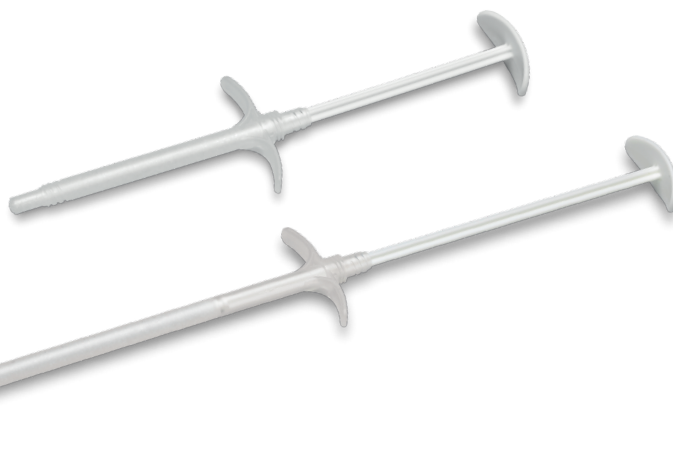
High extrusion volume for placement into larger open wounds



Order number	Product	Volume	Outer diameter	Length
200053	NanoBone SBX Putty	10.0 ml	18 mm	100 mm
200052	NanoBone SBX Putty	5.0 ml	18 mm	100 mm
200051	NanoBone SBX Putty	2.5 ml	11 mm	70 mm

NanoBone QD

Slender profile for placement into deep cavities and minimally invasive procedures



Order number	Product	Volume	Outer diameter	Length
200073	NanoBone QD	10.0 ml	8 mm	185 mm
200072	NanoBone QD	5.0 ml	8 mm	185 mm
200071	NanoBone QD	2.5 ml	8 mm	100 mm
200070	NanoBone QD	1.0 ml	8 mm	100 mm

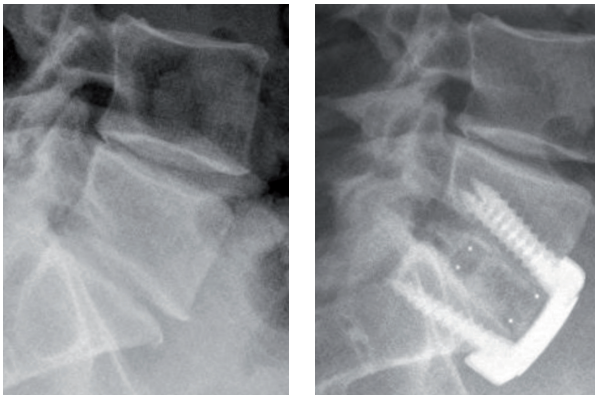
Define success on a different scale

In clinical studies, NanoBone achieved rapid, reliable fusion and healing rates comparable to autograft.^{2,3}

- ✓ Rapid and reliable fusion
- ✓ No need for biological bone graft
 - but can be easily added
- ✓ No foreign body reaction
- ✓ Hydrostable

NanoBone has been used successfully in **over 100,000** clinical cases.

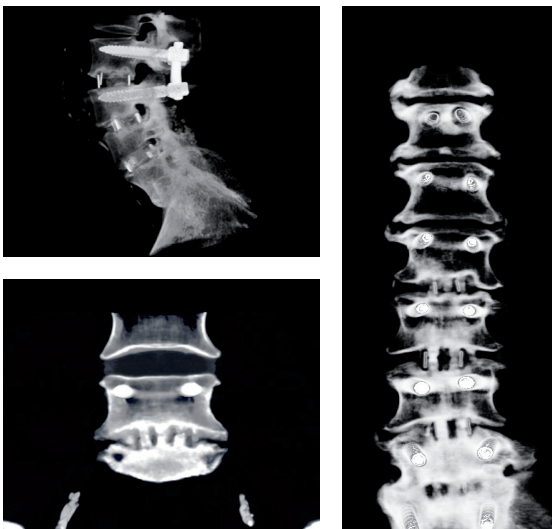
NanoBone ALIF study¹⁵



92% fusion rate reached at **3 months** in the NanoBone group.

No foreign body reaction.

NanoBone PLIF study¹⁶



90% fusion rate reached at **9 months** in the NanoBone group.

28% improvement in overall Oswestry Disability Index (ODI) score.

47% improvement in pain on Visual Analogue Scores (VAS).

No foreign body reaction.

NanoBone benign bone tumor study¹⁷

98 patients with benign bone tumors

Implantation sites included:

- proximal humerus
- distal radius
- femur
- tibia
- hand
- foot

Rapid

4-12 week healing time:
with remodeling like natural bone
– with or without use of cryosurgery
(radiologically confirmed)

At week

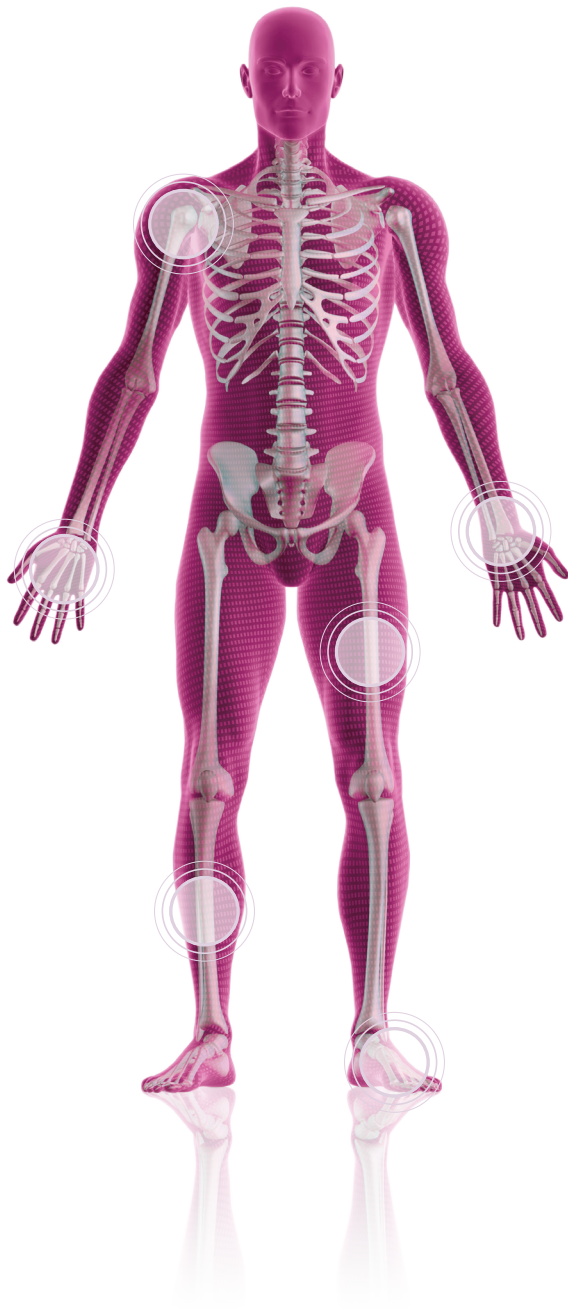
12 **all patients:**
fully active and weight-bearing.
Bony incorporation with early
remodeling, new bone growth and
reintroduction of trabecular bone

No post-operative infections

or fracture with long term follow-up



NanoBone immediately post-op in the femur, at 3 months in the humerus, and at 6 months in the calcar, illustrating stages of remodeling and healing.



The Biocomposites Companion

Your essential guide to making the most of NanoBone and our other products – all in one straightforward app.

- ✓ Why NanoBone: benefits
- ✓ Top tips: tried and tested advice for surgeons
- ✓ FAQs: common questions answered
- ✓ Product range: what's available

To download your
Biocomposites Companion,
simply scan the QR code.



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Patents granted: EP 1 624 904 B1, US 8,715,744 B2, JP4764821B2, 284158, CA2537620C, RU2354408C2, ZL200480020915.3, DE 50 2004 002 554.4, ES2280969T3, AU 2004241740 B2, HK1080766A1, EP 3 600 464 B1, US 11,324,859 B2, JP7118132B2, CN110650754B, DE 50 2018 009 567.7, ES2917406T3, MX2019011659A, RU2768695C2, 386769, AU2018246310A1, BR112019020029A2, CA3058253A1

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Innovation is at the heart of what we do

Biocomposites' innovative calcium compound and polymer products range from bone grafts to implants that aid in the treatment of infection. Possessing unique characteristics for regenerating bone and managing infected sites, our products are opening new possibilities for surgeons around the world.

Find out more at biocomposites.com