NanoBone®

POWER TO REMODEL RAPIDLY

Biocomposites®

NanoBone can be placed in wet or dry sites and can be used in a variety of orthopaedic surgeries and in posterolateral spine[1]

Ideal properties of bone graft

- Easy to prepare and apply
- Rapid and reliable bone formation
- Completely absorbs

Perfect partner for remodelling 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 harvesting[1]
- ✔ Rapid absorption and reliable bone fusion[1]
- ✔ Proven osteoinductive properties[2]
- ✔ Early osteogenesis - silica matrix exchanged for autologous proteins within 10 days[3]
- ✔ Patented nanostructure and optimised composition[4]
- ✔ Preloaded, versatile and ready-to-use[4]

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

Patented nanostructure and optimised composition

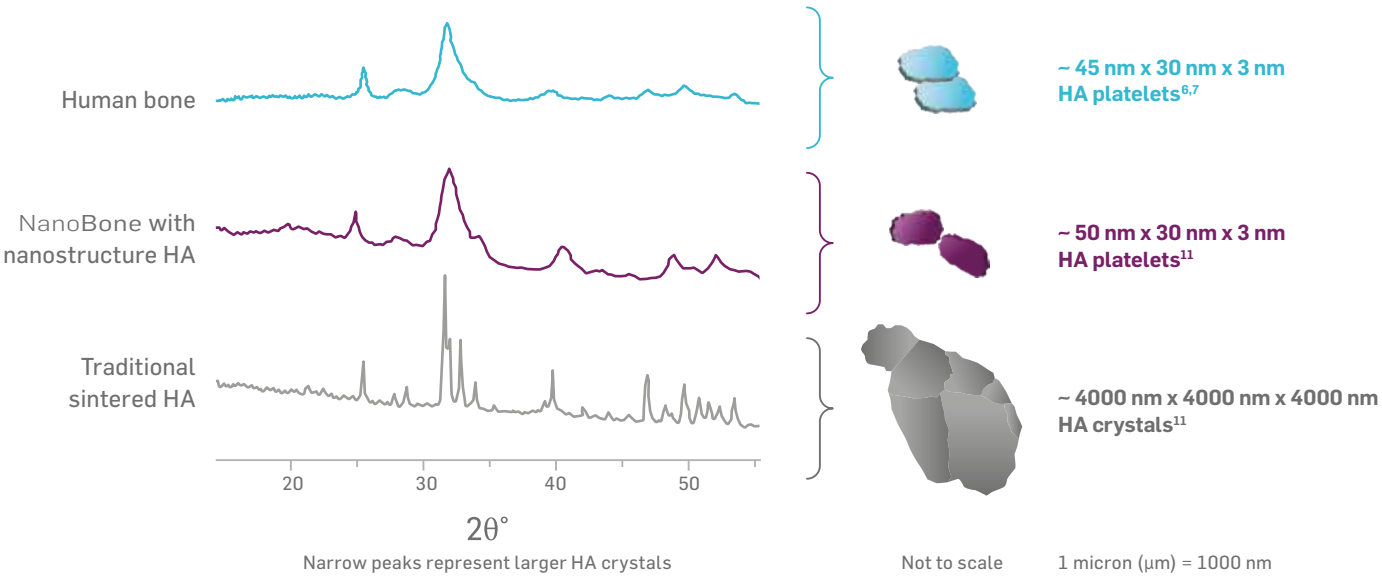
Unlike traditional synthetic HA scaffolds, the HA in NanoBone is precipitated and unsintered to preserve its highly porous and permeable nanoarchitecture and degradation properties. When combined with the high porosity silica gel matrix, NanoBone offers distinct design properties for successful bone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

- Nanostructure of HA platelets is identical in morphology to HA in bone[6,7,8]
- Nanostructure increases autologous protein enrichment[3,9]
- Proven osteoinductive properties[2]

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 remodelling takes place. Traditional sintered HA consists of larger connected crystals which lower porosity and its ability to degrade.[10,11]

HA diffraction patterns[8]



Narrow peaks represent larger HA crystals

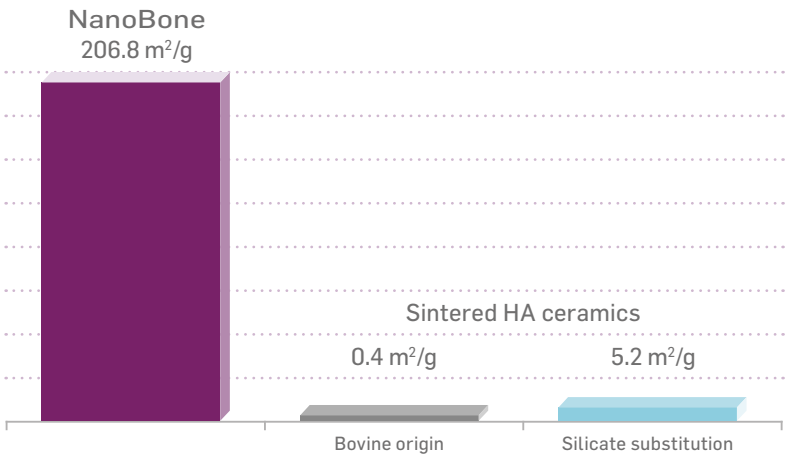
Not to scale

1 micron (µm) = 1000 nm

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.[3,9,11]

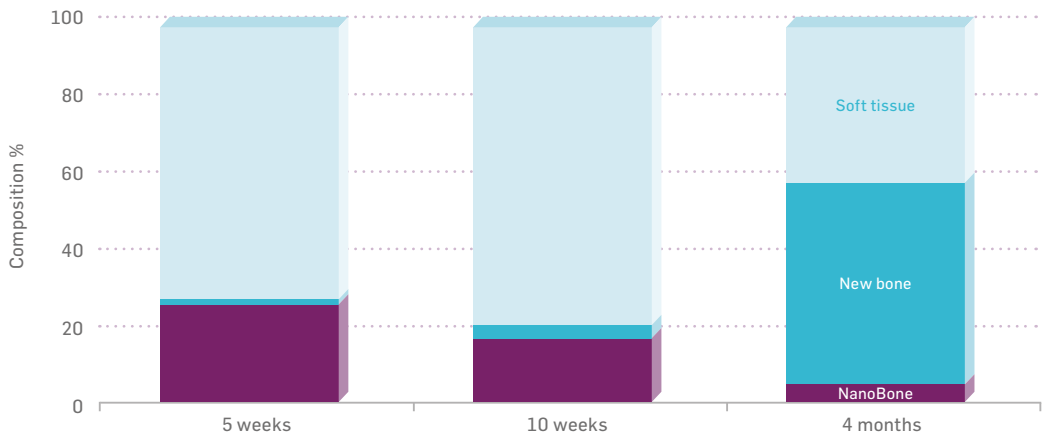
Specific surface area[9,11,12]



Proven osteoinductive properties

Exchange of the silica gel for autologous proteins, in combination with nanostructured HA, provides a compound very similar to that of skeletal bone and promotes bone remodelling.[2,11]

Histomorphometric findings in subcutaneous tissue[2]



In-vivo study - osteoinduction in mini pig model

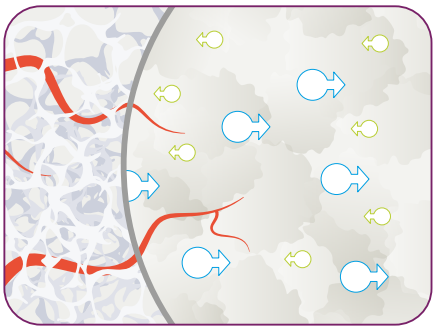
Reliable, early osteogenesis and bone formation

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.[3,10]

Phase 1 approx. 10 days

Neovascularisation of the defect and attraction of autologous proteins

Silica from the carrier and the granules is released to accelerate neovascularisation and is then exchanged for an organic matrix of autologous proteins: inc. BMPs, osteocalcin, osteopontin, glycoproteins.[3,10,13]



Phase 2 approx. 100 days

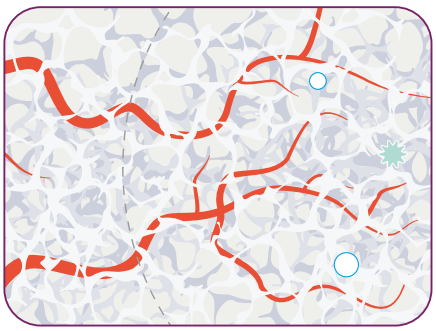
Remodelling – absorption of nanostructured hydroxyapatite and proteins

Combination of nanostructured hydroxyapatite and organic matrix of autologous proteins promotes rapid bone remodelling and formation of woven bone.[3,10,13]

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.[10,13]



Save procedure time and resource

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

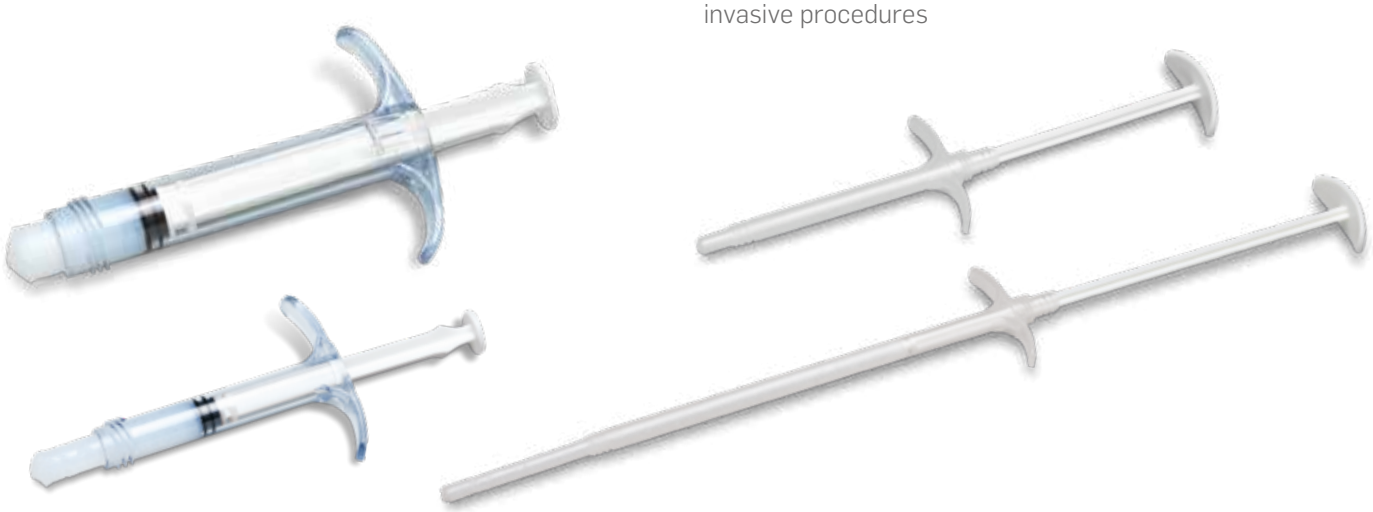
- ✔ No mixing or preparation time needed
- ✔ Versatile, ergonomic handling and placement
- ✔ Holds form when moulded and adheres to surfaces

NanoBone SBX Putty

High extrusion volume for placement into larger open wounds

NanoBone QD

Slender profile for placement into deep cavities and minimally invasive procedures



Order number	Product	Volume	Outer diameter	Length
200049	NanoBone SBX Putty	1.0 ml	11 mm	70 mm
200051	NanoBone SBX Putty	2.5 ml	11 mm	70 mm
200052	NanoBone SBX Putty	5.0 ml	18 mm	100 mm
200053	NanoBone SBX Putty	10.0 ml	18 mm	100 mm

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

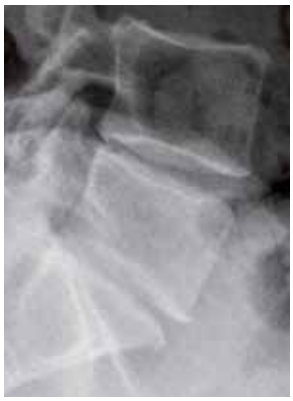
Define success on a different scale

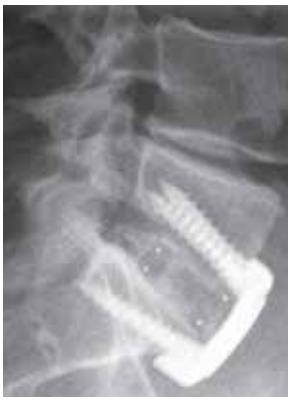
In clinical studies, NanoBone achieved rapid, reliable fusion with complications and healing rates at least comparable with autograft.[1]

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

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

NanoBone ALIF study[14]

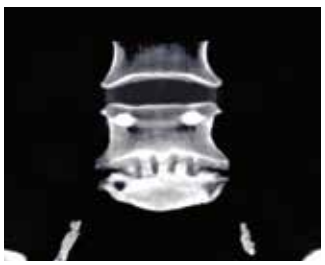


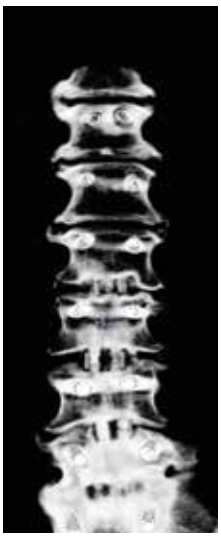


92% fusion rate reached at **3 months** in the NanoBone group.

No foreign body reaction.

NanoBone PLIF study[15]



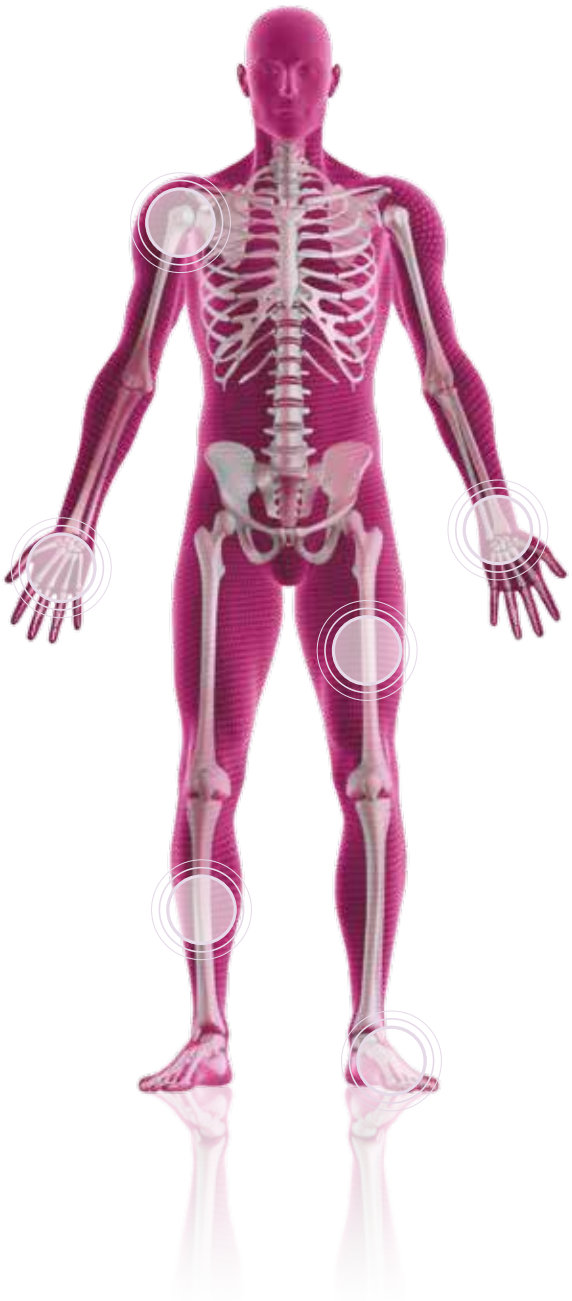


90% fusion rate reached at **9 months** in the NanoBone group.

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 tumour study[16]

98 patients with benign bone tumours

Implantation sites included:

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

Rapid

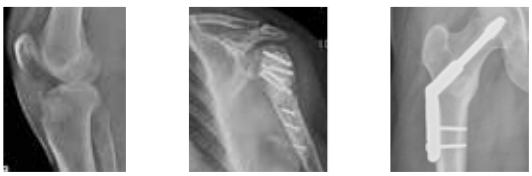
4-12 week healing time:
with remodelling like natural bone – with or without use of cryosurgery (radiologically confirmed)

At week

12

all patients:
fully active and weight-bearing. Bony incorporation with early remodelling, 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 remodelling 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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- ✔ Silica matrix exchanged for autologous proteins within 10 days[3]
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- ✔ Preloaded, versatile and ready-to-use[4]

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

Biocomposites®