

# NanoBone<sup>®</sup>

POWER TO REMODEL RAPIDLY



NanoBone can be placed in wet or dry sites and has a wide variety of uses for the regeneration of bony defects and augmentation in spinal and orthopaedic surgeries<sup>1</sup>

Ideal properties of bone graft

Easy to  
prepare and  
apply

Rapid and  
reliable bone  
formation

Completely  
absorbs

# NanoBone®

## 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<sup>1</sup>
- ✓ Rapid absorption and reliable bone fusion<sup>1</sup>
- ✓ Proven osteoinductive properties<sup>2</sup>
- ✓ Early osteogenesis - silica matrix exchanged for autologous proteins within 10 days<sup>3</sup>
- ✓ Patented nanostructure and optimised composition<sup>4</sup>
- ✓ Preloaded, versatile and ready-to-use<sup>4</sup>



Spinal stabilisation | 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

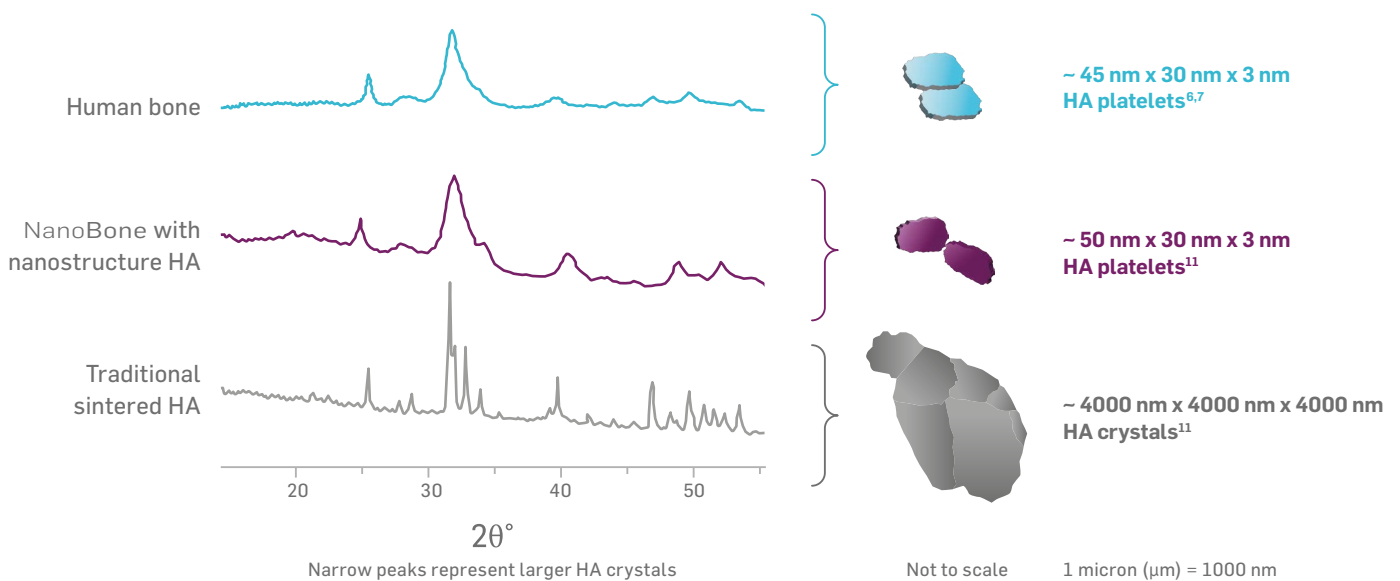
Unlike traditional synthetic HA scaffolds, the HA in NanoBone is precipitated and unsintered to preserve its highly porous and permeable nanoarchitecture and degradation properties. When combined with the high porosity silica gel matrix, NanoBone offers distinct design properties for successful bone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

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

## 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.<sup>10,11</sup>

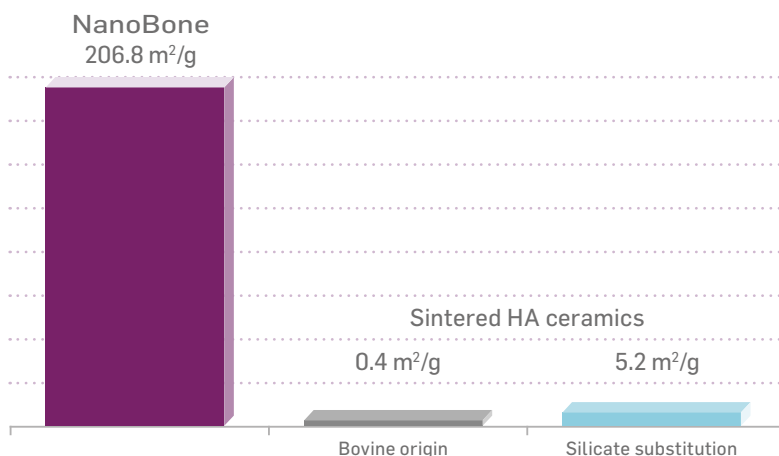
### HA diffraction patterns<sup>8</sup>



## 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.<sup>3,9,11</sup>

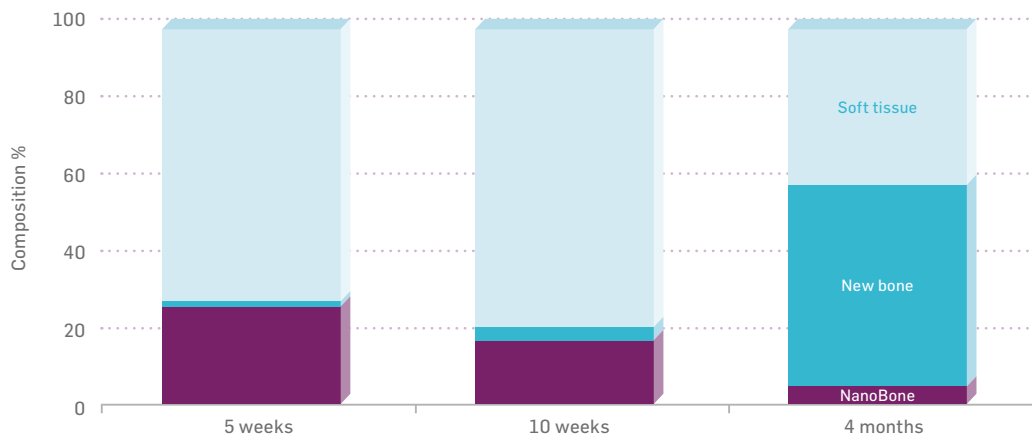
### Specific surface area<sup>9,11,12</sup>



## 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.<sup>2,11</sup>

### Histomorphometric findings in subcutaneous tissue<sup>2</sup>



*In-vivo* study - osteoinduction in mini pig model

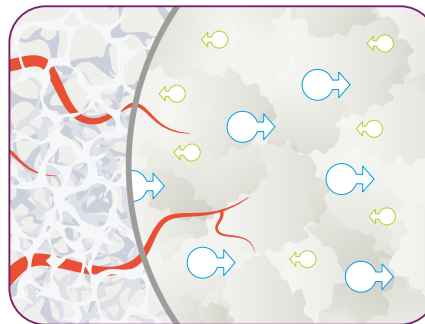
## Reliable, early osteogenesis and bone formation





Bone healing is a multi-dimensional process. NanoBone is quickly transformed by the body into a biomimetic organic matrix that integrates into physiological bone turnover at a very early stage.<sup>3</sup>

### 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.<sup>3,10,13</sup>

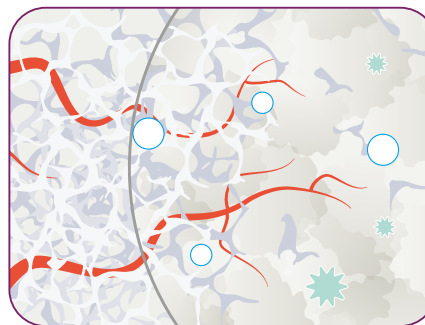






-  NanoBone
-  Vasculature
-  Autologous protein migration through NanoBone
-  Silica molecules released from NanoBone

### Phase 2 approx. 100 days

#### Remodelling – absorption of nanostructured hydroxapatite and proteins

Combination of nanostructured hydroxapatite and organic matrix of autologous proteins promotes rapid bone remodelling and formation of woven bone.<sup>3,10,13</sup>

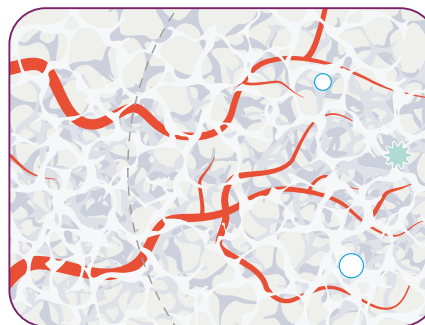






-  Woven bone
-  Vasculature
-  Osteoblast forms woven bone
-  Osteoclasts degrade biomaterial

### Phase 3 beyond 100 days

#### Completion – absorption of woven bone and formation of lamellar bone

Remaining nanostructured hydroxapatite and organic matrix of autologous proteins are biodegraded by osteoclasts, and osteoblasts form new lamellar bone.<sup>10,13</sup>



-  Lamellar bone
-  Vasculature
-  Osteoblast forms 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 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

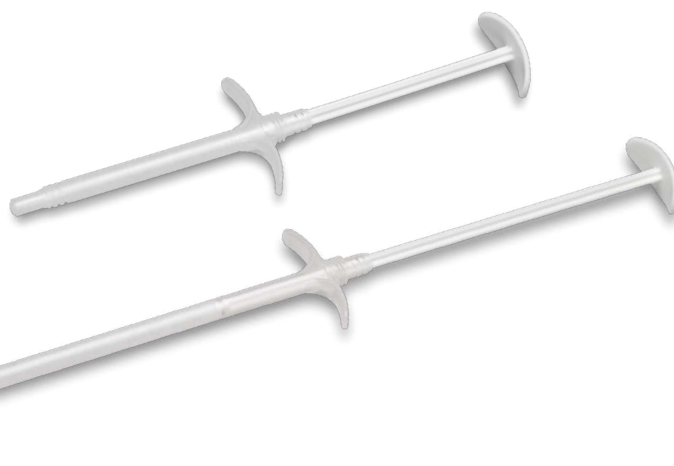
### NanoBone SBX Putty

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

# NanoBone<sup>®</sup>

## Define success on a different scale

In clinical studies, NanoBone achieved rapid, reliable fusion with complications and healing rates at least comparable with autograft.<sup>1</sup>

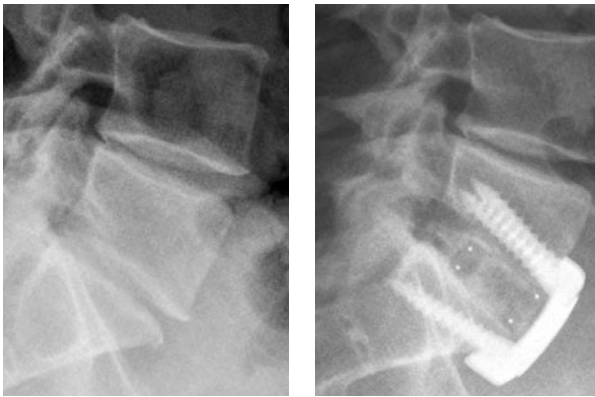
- ✓ Rapid and reliable fusion
- ✓ No need for biological bone graft  
- but can be easily added
- ✓ No foreign body reaction

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NanoBone has been used successfully for **more than 9 years** in **over 100,000** clinical cases.

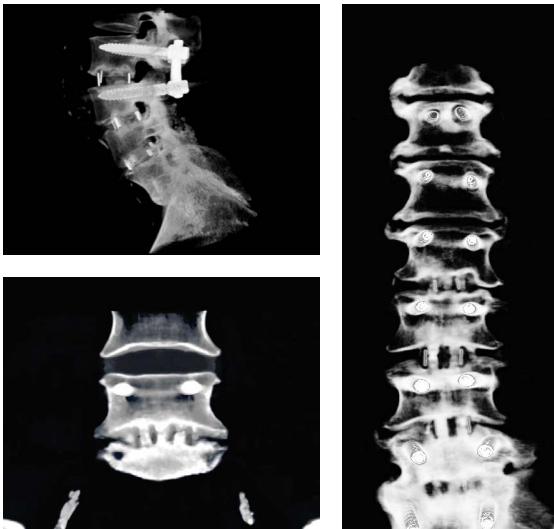
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### NanoBone ALIF study<sup>14</sup>



**92% fusion rate** reached at **3 months** in the NanoBone group.  
**No foreign body** reaction.

### NanoBone PLIF study<sup>15</sup>



**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<sup>16</sup>

**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 weightbearing.  
Bony incorporation with early  
remodelling, new bone growth and  
reintroduction of trabecular bone

### No post-operative infections

or fracture with long-term follow-up



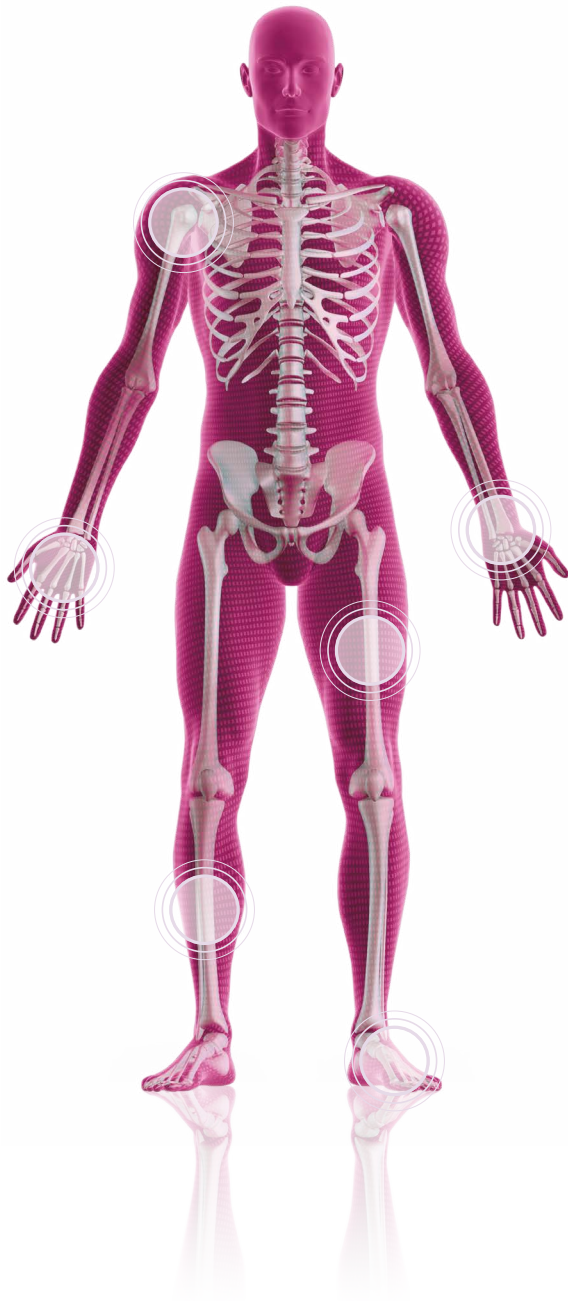
Immediately  
post-op



3 months  
post-op



6 months  
post-op

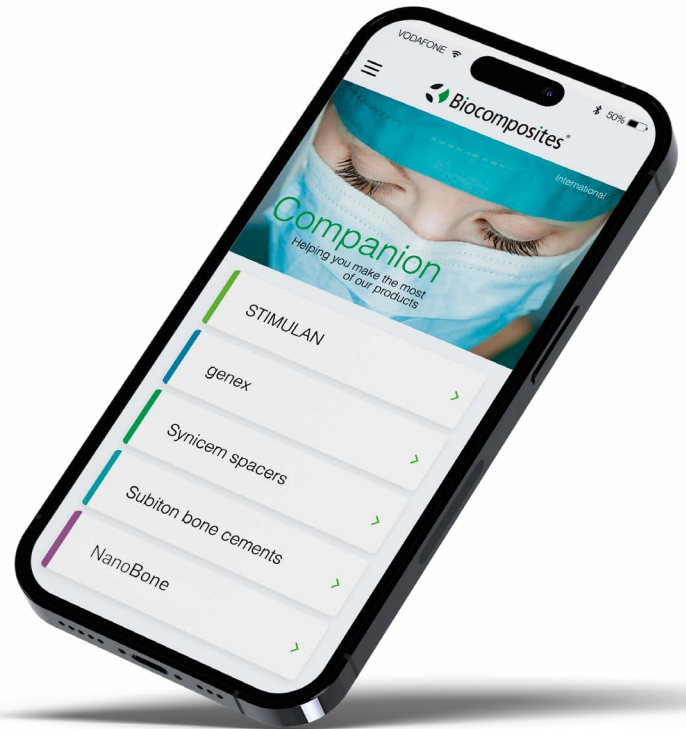


# The Biocomposites Companion

Your essential guide to making the most of NanoBone – 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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- ✓ Rapid absorption and reliable bone fusion<sup>1</sup>

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- ✓ Comparable healing rate to autograft<sup>1</sup>

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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](http://biocomposites.com)