

Canine and Feline Freeze-dried Bone Allograft the most cost-effective way to induce bone formation

The Science

Demineralised bone matrix (DBM) is prepared by Veterinary Tissue Bank from ethically-sourced donor cortical bone. A careful process of cell, lipid and mineral removal, releases growth factors within bone such as BMP-2 and TGF β that induce bone formation. The species-specific nature of these growth factors ensures optimal binding to host receptors. Studies on DBM have shown that:

- DBM is osteoinductive¹
- DBM provides species-specific growth factors²
- DBM is effective³

The efficacy of DBM is traditionally assessed by placement into epaxial muscles of nude rats. Even in this challenging situation, DBM is able to induce ectopic bone formation.

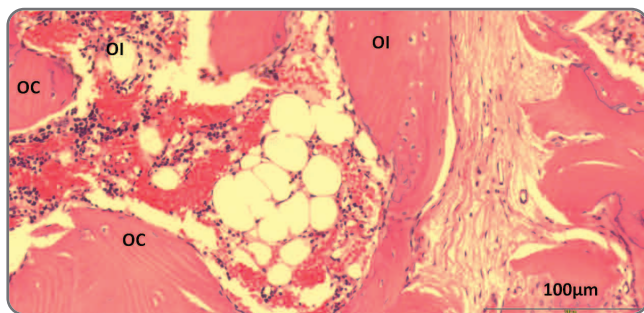


Figure 1. Demineralised bone matrix (DBM) was implanted in biceps femoris muscle of a nude rat and sections taken at 28 days. The slide (haematoxylin and eosin) shows the implanted demineralised bone matrix (DBM) with empty lacunae (processing of the DBM destroys viable cells). However, there is clear evidence of osteoinduction (OI) with the presence of new woven and lamellar bone with osteocytes within lacunae. Furthermore, some of the new bone is laid down adjacent to the DBM indicating osteoconduction (OC). In addition, bone marrow, chondroblasts, osteoblasts, osteoclasts and neovascularisation are visible.

Although the effect of DBM cannot be explained by the action of a single growth factor, we have recently measured the BMP-2 content of canine DBM. We demonstrated the presence of BMP-2 within the canine DBM in nanogram (10^{-9}) quantities; it is known that growth factors are biologically active in pictogram (10^{-12}) quantities. Thus DBM is likely to provide supraphysiological quantities of BMP-2.

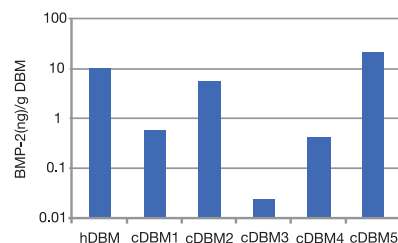
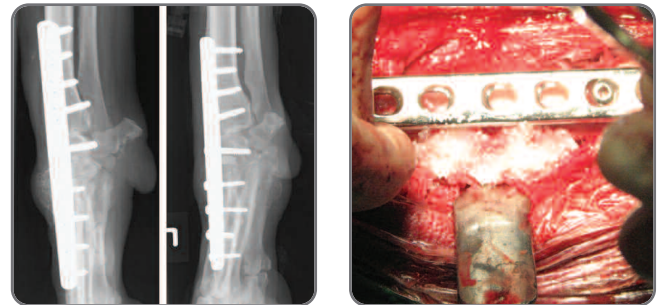


Figure 2. BMP-2 concentrations measured by ELISA in 5 different batches of canine DBM (cDBM). A single sample of human DBM (hDBM) was used as a positive control. Although concentrations vary, the minimum concentration was over 10pg/g. (The assay is designed for human BMP-2 and actual cDBM concentrations may be higher than measured due to reduced antibody activity.)

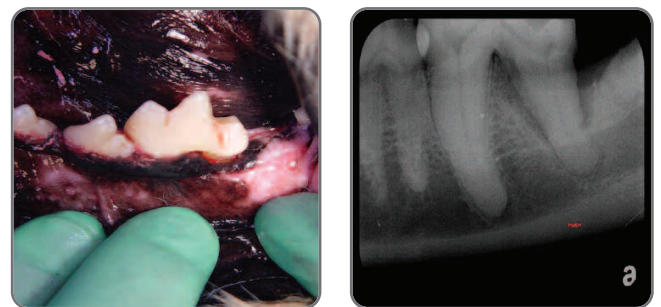
Clinical uses of DBM and cancellous chips

DBM can be used in a variety of situations:

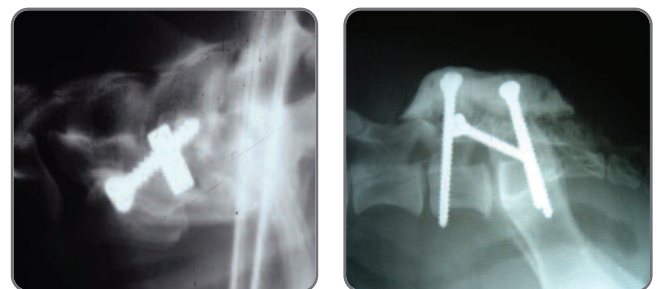
- **Orthopaedic uses:**
 - Small joint arthrodesis (carpus, tarsus)
 - Grafting around reconstructed fractures in adult dogs
 - Composite grafting with cancellous chips:
 - Large joint arthrodesis (shoulder, elbow, stifle)
 - Filling fracture gaps (buttress fixation)



- **Dental uses:**
 - Extraction socket grafting
 - Ridge and sinus augmentation
 - Bony defects
 - Periodontal regeneration



- **Neurosurgical uses:**
 - Atlantoaxial subluxation
 - Cervical spinal fusion (Wobbler syndrome)
 - Thoracolumbar fusion (Type II disc disease)
 - Lumbosacral fusion (LS compression)



References

1. Innes J, Myint P: Demineralised bone matrix in veterinary orthopaedics: A review. *Veterinary and Comparative Orthopaedics and Traumatology* 23:393-399, 2010.
2. Clayton J, Redmond C, Myint P, Innes J: Assessment of the osteoinductive properties of freeze-dried canine demineralised bone matrix (DBM), in Vezzoni A (ed): 3rd World Veterinary Orthopaedic Congress, Vol. Bologna, Italy, ESVOT, 2010.
3. Hoffer MJ, Griffon DJ, Schaeffer DJ, Johnson AL, Thomas MW: Clinical applications of demineralized bone matrix: A retrospective and case-matched study of seventy-five dogs. *Veterinary Surgery* 37:639-647, 2008.

What vets are saying about Veterinary Tissue Bank...



"I got involved with Veterinary Tissue Bank because I was frustrated with the lack of access to cost-effective, ready-to-use, off-the-shelf bone graft solutions for my patients.

We have now been using VTB products routinely in our orthopaedic referral service for the last four years and they have certainly made a big impact on the efficiency and quality of care for our patients"

Professor John Innes,

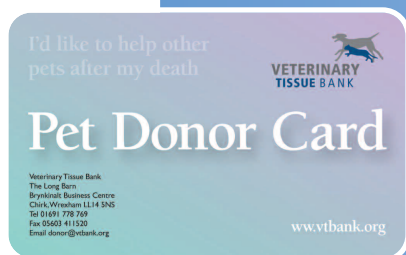
RCVS Specialist in small animal orthopaedics,
Small Animal Teaching Hospital, University of Liverpool, UK



"I've been using Veterinary Tissue Bank's products for nearly two years now in a range of situations from spinal fusions and arthrodeses to fracture repairs. DBM provides us with predictable osteoinduction in some challenging situations."

John Ferguson

BVM&S CertSAO MRCVS
East Neuk Veterinary Clinic, Fife, Scotland



Graft production & quality assurance

- All pet donors are screened according to the Donor Selection Criteria and authorised by veterinary medical director prior to processing.
- Processing is carried out using aseptic methods in a clean room of class 10,000 which has much higher air changes per hour than operating theatre, in accordance with BS EN ISO 14644 (clean rooms and associated controlled environments) and EU GMP (Good Manufacturing Practices - Medicinal products for human and veterinary use).
- Freeze dried tissues are subject to terminal sterilisation using irradiation to ensure sterility.
- Full record keeping from donation through processing to clinical use is maintained. A transplant recipient form accompanies every graft.
- All grafts carry 5 years shelf life at ambient temperature storage.



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