Spine Orthobiologics

Product Portfolio I 2021

Arthrex®

Helping Surgeons Treat Their Patients Better™

Since its inception, Arthrex has been committed to one mission: Helping Surgeons Treat Their Patients Better. We are strategically focused on constant product innovation through scientific research, surgeon collaboration, and medical education to make less invasive surgical procedures simpler, safer, and more reproducible. Each year, we develop more than 1000 new innovative products and procedures to advance minimally invasive orthopedics worldwide.

Arthrex has always remained a privately held company, which allows for the rapid evaluation of new technologies and ideas, and the freedom to develop products and techniques that truly make a difference without economic considerations or compromise. Our experienced team of dedicated professionals represents a shared passion and commitment to delivering uncompromising quality to the health care providers who use our products and the millions of patients whose lives we impact.

The medical significance of our contributions serves as our primary benchmark of success and will continue into the future as the legacy of Arthrex.

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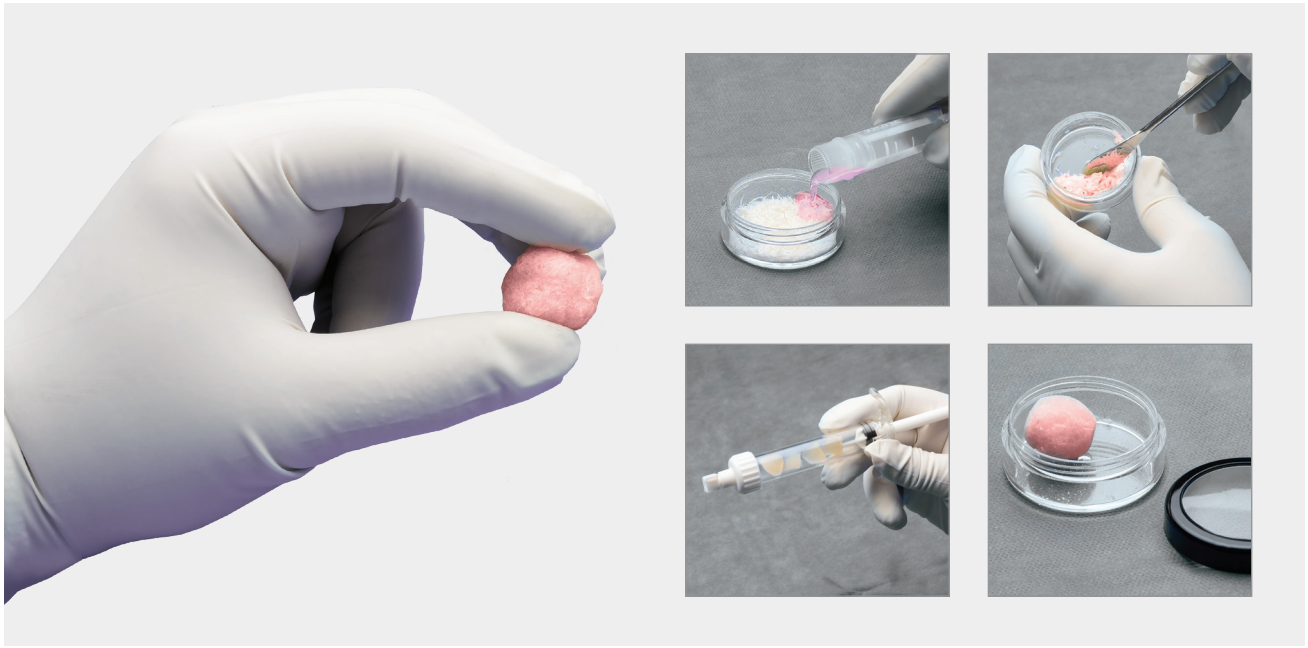
Bone Repair

ArthroCell™ Viable Bone Matrix



Viable Bone Matrix

ArthroCell allograft is a moldable cellular allogenic bone matrix intended for use in bone defects and remodeling for a variety of orthopedic applications.

- ArthroCell allograft is an HCT/P allogenic bone scaffold
- Final product is moldable for optimal handling (Figure 1)
- Cell viability and function are preserved using a novel cryoprotectant that is DMSO-free and does not require decanting prior to use
- Product shelf life is 2 years from date of processing when stored at -65˚C or colder
- Preparation time on back table is less than 20 minutes, and ArthroCell allograft has a 4-hour working window for implantation after thaw without loss of cell viability
- ArthroCell allograft is a safe, nonimmunogenic alternative to autograft
- Donors processed for ArthroCell allograft undergo rigorous screening, testing, and culturing that meet FDA and American Association of Tissue Banks (AATB) guidelines

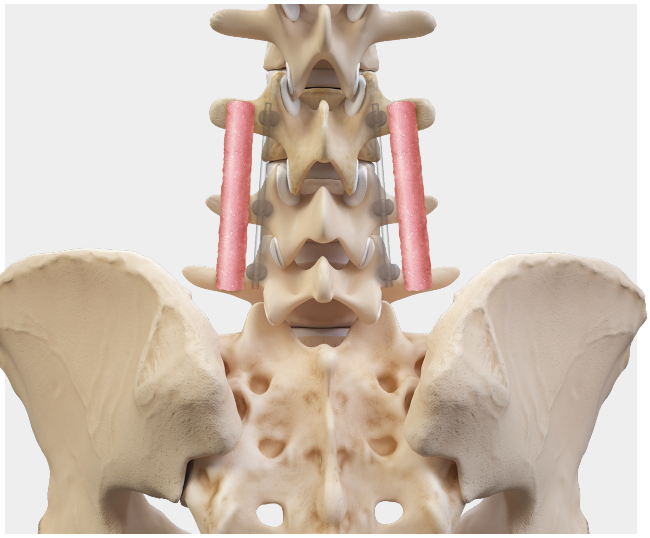
ArthroCell allograft provides the essential elements for optimal bone repair:

- An osteoconductive 3-dimensional scaffold with cortical and cancellous components[1]
- A demineralized bone component with osteoinductive potential, which provides exposure of signaling molecules and bone morphogenetic proteins[2]
- Cells to support osteogenic healing processes[3-5]

Figure 1. ArthroCell allograft components.

ArthroCell

ArthroCell™ Cellular Bone Graft



Cellular Advantage

Mesenchymal stem cells (MSCs) are a type of adult stem cell present in ArthroCell allograft that have the ability to self-renew and differentiate into bone, cartilage, fat, muscle, and tendon.[6]

- MSCs are the osteogenic cells required for bone repair, remodeling, and maturation
- MSCs can differentiate into osteoblasts that subsequently make new bone
- MSCs do not stimulate allogenic rejection and are not eliminated by the host immune system[7]

ArthroCell allograft cellular advantage:

- Cellular component is recovered from donors aged 15 to 55 years, frozen, and packaged within 120 hours postmortem
- Cells are recovered from the vertebral body region, an area known to be rich in MSCs[8]
- Cells are preserved in a novel cryoprotectant to preserve cellular identity after thaw:
  - DMSO-free
  - Nontoxic
  - Decanting not required prior to use
- Additional cell population includes:
  - MSCs
  - Osteoprogenitor cells
  - Flow cytometry analysis demonstrates high expression of SSEA-4, a marker for pluripotent cells and MSCs

ArthroCell

Safety

Donor tissue processing:

- ArthroCell allograft is processed at Vivex Biomedical, Inc. in an aseptic manner in Class 100 clean rooms using proprietary procedures and screening criteria that meet the requirements of the AATB
- ArthroCell allograft is collected from donors who have been screened by licensed laboratories and physicians following a process that meets FDA and AATB requirements for testing
- Donor testing includes nucleic acid and/or antibody tests for the following pathogens:
  - HIV-1 and -2
  - Hepatitis B and C
  - Human T-lymphocyte virus
  - Syphilis rapid plasma screen
  - T. pallidum IgG screen
  - Cytomegalovirus (CMV) antibody (IgG and IgM)
- Donor screening:
  - Medical and social history review
  - Physical examination
  - Medical record evaluation, including autopsy (if performed)
  - Licensed physician review of donor record
- Mixed lymphocyte reaction (MLR) assay:
  - MSCs are known to be immune-privileged cells that do not elicit an immune response.[7] To ensure complete safety of the cell component, a MLR assay was performed to assess the potential for activation of T-cell proliferation on samples of ArthroCell allograft along with positive and negative controls.[9]
  - Stimulation indices for the test samples were near or below that for the negative control, while positive controls performed as expected and demonstrated a robust response. ArthroCell allograft therefore does not stimulate an immune response (Figure 2).

SI of PBMCs with UMTB® test MSCs from 3 donors (high and low)[9]

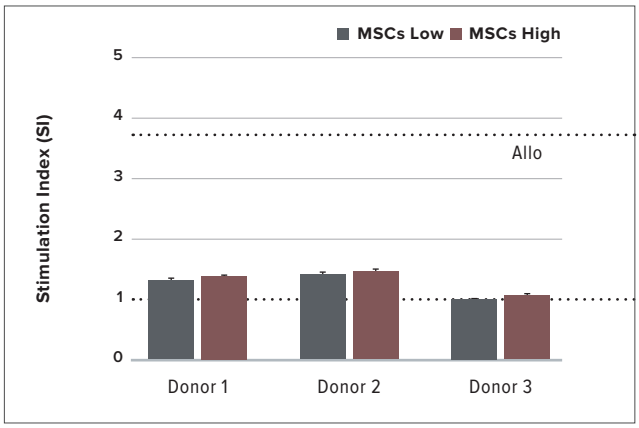


Figure 2. Stimulation index calculated from BrdU ELISA ABS450 relative to PBMCs. Dotted line at SI 3.84 represents response of positive 2-way allogeneic MLR response. Dotted line at 1.00 represents response of the negative control. Stimulation indices for test samples range from 1.02 to 1.35.

UMTB = University of Miami Tissue Bank

ArthroCell

AlloSync™ Expand Demineralized Cortical Fibers

The unique geometry of AlloSync Expand 100% demineralized bone is ideal for intraoperative handling and controlled expansion into bone voids. AlloSync Expand fibers come preloaded in a syringe that allows for consistent hydration of the graft with biologic fluids, such as bone marrow aspirate.

Features and Benefits

- Comprised of 100% demineralized cortical bone fibers
- Provides a scaffold for cellular attachment and proliferation
- Graft will expand and improve fill during hydration
- Sterile to device-grade standards (10^{-6} SAL)
- Ambient temperature storage

100% Demineralized Bone Fibers

- No added fillers for maximum demineralized bone content and osteoinductive potential
- Specific fiber geometry provides exceptional handling and controlled expansion
- Lyophilized fibers extend shelf life while preserving the osteoinductive potential

Expands to Fill Gaps

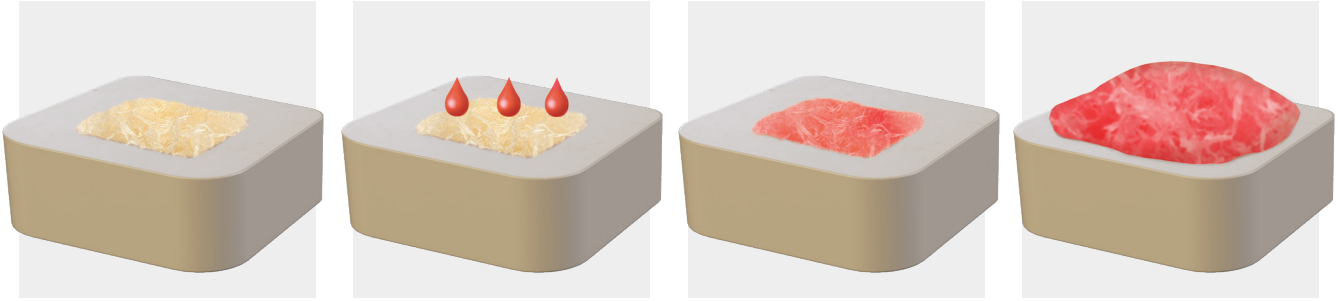
- Wicks blood, bone marrow, and other physiological fluids that allow the graft to expand and improve fill

Cellular Highways

- Fibers have demonstrated superior bone-forming capacity compared to standard particulate demineralized bone marrow[10]
- Entangled fibers create a 3D interconnected matrix to promote cell migration and fusion

Simplicity of Hydration

- Luer lock portal delivers a simple yet thorough hydration process
- Flexibility to select various hydration fluids

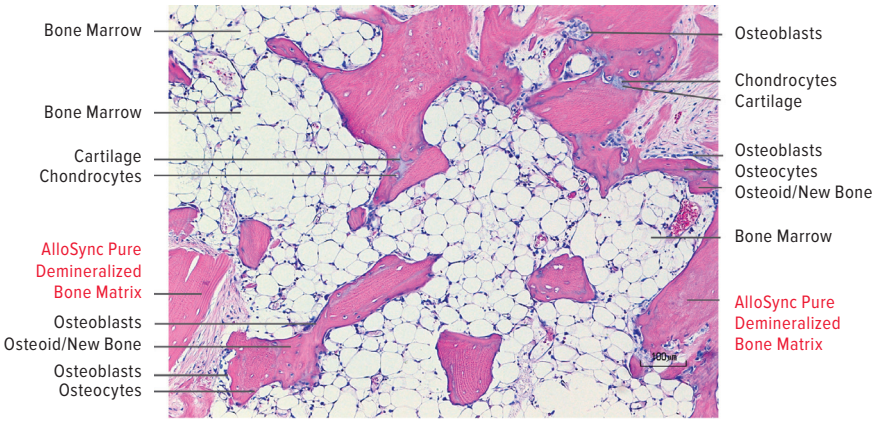


ALLOSYNC

AlloSync™ Pure Demineralized Bone Matrix

AlloSync Pure osteoinductive demineralized bone matrix is derived from 100% human allograft bone with no extrinsic carriers. When prepared, AlloSync Pure resists irrigation and can be used in a fluid environment. The clinician can control the handling properties of AlloSync Pure bone matrix, which includes decreasing the viscosity for injectable applications or increasing the viscosity to add autograft and/or allograft. The proprietary rice-shape fiber technology used to process AlloSync Pure bone matrix increases the osteoinduction and osteoconductive surface area to accelerate cellular ingrowth.

- Derived from 100% human allograft bone without any extrinsic carriers
- Post-sterilization, every lot is tested in vivo to ensure osteoinductivity
- Demineralization process preserves native bone morphogenetic proteins (BMPs) and growth factors
- Resists irrigation
- Histologically proven to contain all five elements of bone formation, including new bone, bone marrow, osteocytes, chondrocytes, and cartilage postimplantation at 28 days[11]
- May be hydrated with bone marrow concentrate (BMC), platelet-rich plasma (PRP), blood, saline, or other cellular components
- Sterile to device grade standards (10^{-6}) and stored at ambient temperature
- Provided in a ready-to-use mixing jar
- Four sizes available
- 5-year shelf life

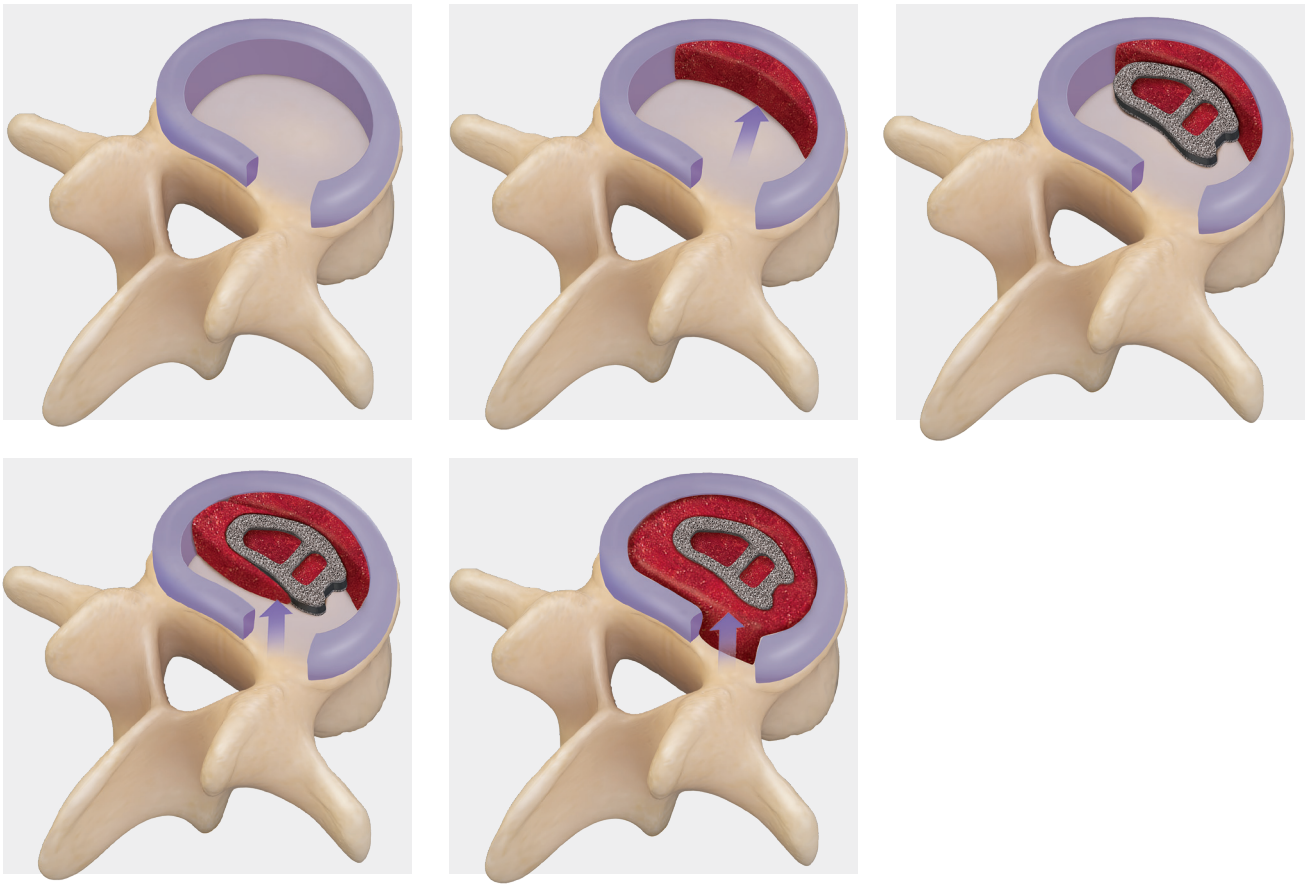


AlloSync Pure demineralized bone matrix histology

ALLOSYNC PURE

AlloSync™ Pure Demineralized Bone Matrix

AlloSync Pure demineralized bone matrix is ideal for uses in an aqueous environment, such as during endoscopic fusion.



ALLOSYNC PURE

AlloSync™ Putty, Gel, and Paste

AlloSync gel, putty, and paste provide customizable consistencies

Comparison of Two DBMs

RPM Carrier

Glycerol Carrier

AlloSync Bone Products May Provide Osteoinductive and Osteoconductive Properties

- Osteoinduction—signaling molecules such as bone morphogenetic proteins (BMPs) that aid in cell differentiation down osteoblastic pathways
- Every lot of demineralized bone matrix (DBM) is tested for osteoinductive potential, using either an in vitro assay or in vivo model
- Osteoconduction—scaffolding from DBM particles for osteoblasts to form new bone
- Additional scaffolding properties are provided in AlloSync cancellous bone with the addition of cancellous bone chips

Superior Handling Characteristics via the Reverse-Phase Medium (RPM) Carrier

- RPM is an inert, biocompatible copolymer consisting of polypropylene oxide and polyethylene oxide
- Material is flowable at room temperature and thickens to become more viscous at body temperature
- RPM allows the DBM graft to be moldable and packed into any defect size or shape
- AlloSync bone products will resist irrigation and can be used in a fluid environment without the fear of graft migration, unlike some other DBMs

AlloSync Bone Products Offer Ease of Use and Terminal Sterility

- Provided as a ready-to-use, off-the-shelf product that requires no thawing or premixing preparation
- Terminal sterilization using electron beam results in a sterility assurance level (SAL) of 10^{-6}; process is not harmful to the DBM or its bioactivity
- Room temperature storage

ALLOSYNC

Promote Bone Regeneration

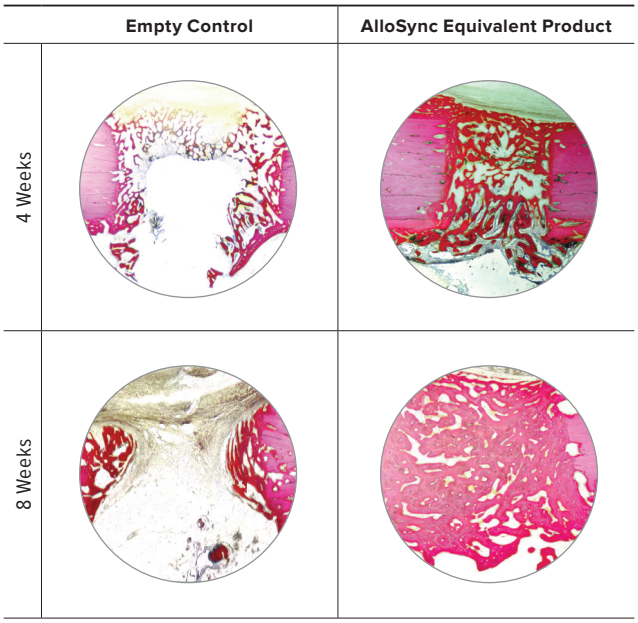


Figure 3.

Scientific Support for AlloSync Bone Products

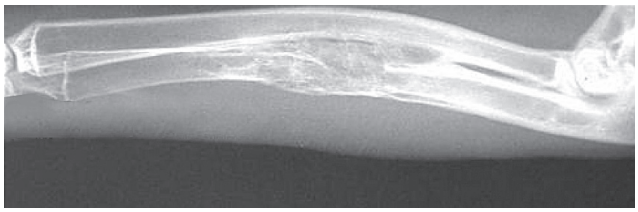
An AlloSync DBM equivalent product (same DBM/RPM ratio) was evaluated in a skeletally mature sheep model. Species-specific DBM was compared to an empty control and autograft. Transcortical defect holes were created in the tibial and metatarsal diaphysis; histology was assessed at 4, 8, and 16 weeks for bone regeneration and graft incorporation. Bone formation was either delayed or unable to bridge the gap within the empty control. The AlloSync equivalent product was able to provide a scaffold and induce osseous bridging across the defect site similar to autograft. This study indicates that AlloSync allograft bone is an effective bone grafting material.[12]

Scientific Support for AlloSync DBM

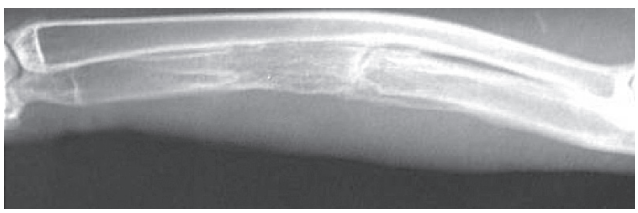
A rabbit ulna critical-sized defect model was used to evaluate a product equivalent to AlloSync DBM (species-specific) as a bone graft extender and substitute. A critical-sized mid-diaphyseal ulna defect was created. The following groups were compared to the intact ulna: 100% AlloSync equivalent, 50/50 mixture of AlloSync equivalent and autograft, and 100% autograft. The DBM was created from rabbit long bones to ensure a species-specific animal model. At 12, 18, and 26 weeks the ulnas were evaluated with radiography, histology, and mechanical testing.

Radiographic assessment showed bone incorporation and bridging across the defect site at 12 weeks for both groups containing the AlloSync equivalent product, which was similar to the autograft alone group. The mechanical testing at 12 weeks revealed statistical equivalence between the DBM groups and autograft alone. The DBM groups were also statistically equivalent to the intact ulna (Figure 3). This study model demonstrated AlloSync functions as well as a bone graft extender with an autograft and as a stand-alone bone graft substitute.[13]

Defect Model



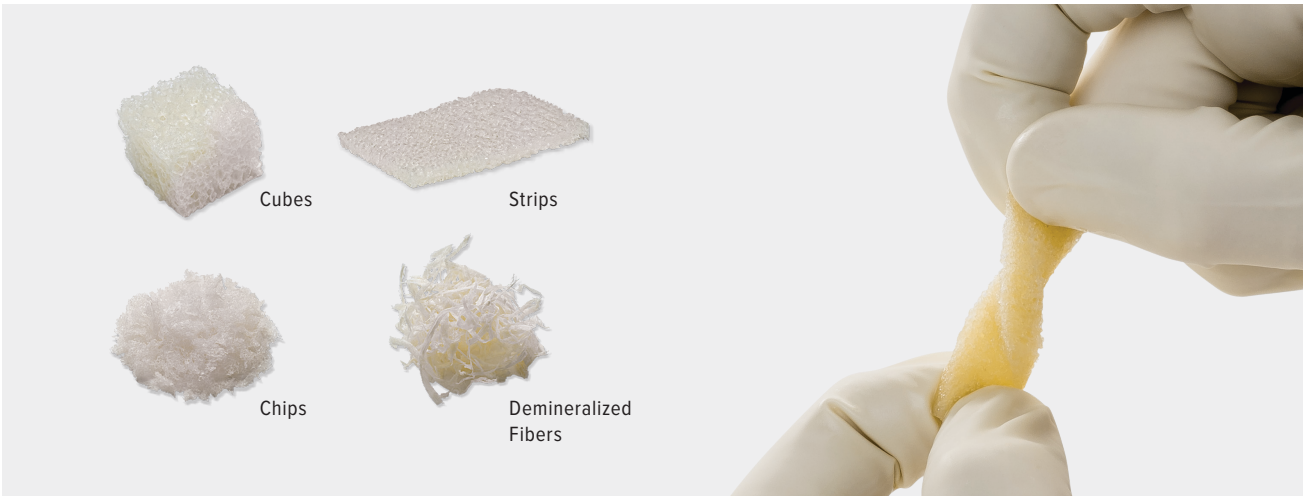
12 Weeks - Autograft Control



12 Weeks - AlloSync Equivalent Product

ALLOSYNC

AlloSync™ Demineralized Cancellous Sponges, Chips, and Cortical Fibers



Cancellous Sponges

- Post-sterilization, every lot is tested in vivo to ensure osteoinductivity
- Demineralized cancellous matrix is comprised of 100% cancellous bone
- Maintains natural bone architecture with interconnected porosity
- Provides optimal scaffold for cellular attachment and proliferation
- Contains exposed natural growth factors with verified osteoinductivity
- Naturally absorbs and retains bioactive fluids like PRP and concentrated bone marrow aspirate (BMA)
  - After rehydration, the product is compressible like a sponge, allowing for flexibility to fit in and around different types of bone defects
- Sterile to device-grade standards (10^{-6}) and stored at ambient temperature

Osteoinductivity Testing[14]

- The AlloSync demineralized sponge was tested in an intramuscular nude rat bioassay via histological evaluations
- After 28 days, the following findings were observed within the AlloSync demineralized sponge group (Figure 4):
  - The porous osteoconductive trabecular bone structure of the implant was maintained and found to be evident within the histological sections
  - Osteoblast-like cells were found lining the trabecular bone network
  - Cellular infiltration and neovascularization were apparent along the edges of the implant but also could be observed throughout the interior portion of the implant

Features and Benefits

- New form of 100% DBM offering excellent handling characteristics without the need for an additional carrier
  - Osteoconductive and verified osteoinductive properties
    - The cortical fibers are demineralized using CellRight Technologies' proprietary process, optimizing the residual calcium level and osteoinductivity
    - Demineralized cortical fibers provide an optimal scaffold for cellular attachment and proliferation
  - Customizable hydration: naturally wicks up bioactive fluids such as PRP and BMA
  - Sterile to device-grade standards (10-6) and stored at ambient temperature

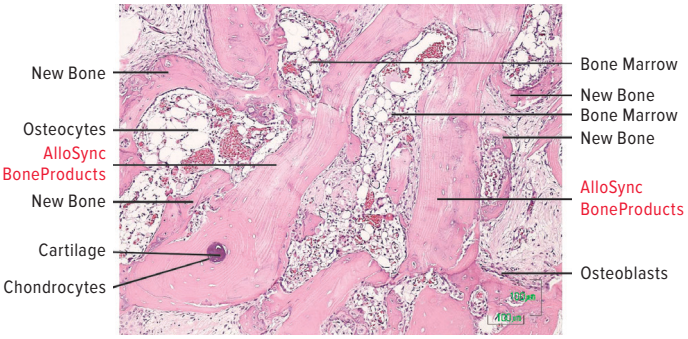
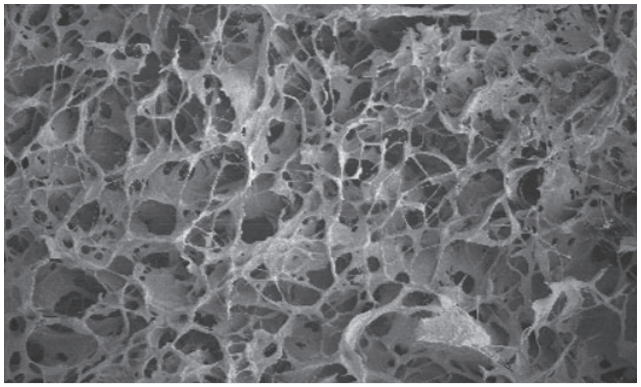
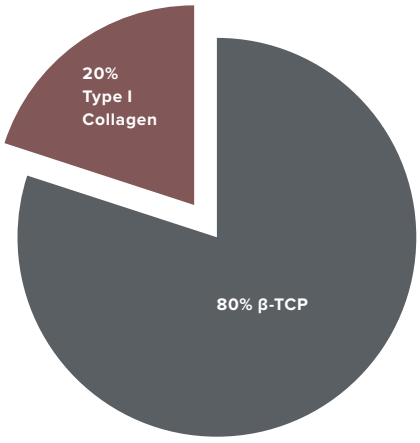


Figure 4. Shows AlloSync sponge histology with all five components of bone growth.

BoneSync™ Putty and Strips





Advanced Engineering

The blend of 20% type I collagen and 80% highly purified beta-tricalcium phosphate (ß-TCP) in the BoneSync putty and strips provides an osteoconductive material for bone regeneration. It was developed to resemble the composition and pore structure of natural human bone.[15]

Engineered Collagen Matrix

Capitalizing on over 20 years of development expertise, with collagen technologies that have been used in more than 10 million patients, the source of collagen found in BoneSync bone void filler is specifically engineered to optimize safety, handling, and performance. The scaffold in BoneSync putty and strips, processed from purified type I collagen, is a critical design element that allows for rapid fluid imbibition, cellular ingrowth, and controlled resorption.

Highly Purified ß-TCP

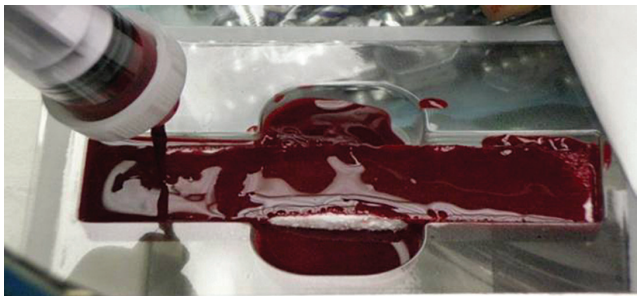
The highly purified ß-TCP component of the BoneSync putty and strips is designed for a resorption profile consistent with bone formation. The porous architecture is specifically engineered for osteoconductivity.[15]

Benefits of the Collagen-Engineered Matrix in Orthopedic Applications

- Specifically engineered to provide a scaffold with a porosity resembling natural bone
- Facilitates incorporation of cells in bone marrow aspirate and tissue cells during the healing process[16]
- The highly purified type I collagen in BoneSync bone void filler is the most abundant type of collagen found in bone
- Purification and biocompatibility minimize the potential for immune response

BONESYNC

BoneSync™ Putty and Strips



Fluid Retention

With an interconnected pore structure engineered for absorbing fluids, BoneSync putty and strips effectively retain BMA within the material.

Cell Binding

Higher densities of collagen provide greater protein-binding sites and have been associated with more effective incorporation of bioactive proteins.[16]

BoneSync putty and strips have an interconnected pore structure that absorbs BMA, which contains cells and proteins that play an important role in bone formation. The collagen in BoneSync putty and strips facilitates the binding of bone-forming cells and proteins.

Diverse Configurations

BoneSync filler is offered in both putty and strip configurations to meet varying application needs and preferences. Each configuration benefits from purified biomaterials and advanced engineering while offering unique advantages to the surgeon.

Strip

Compression-resistant matrix combines the cell-binding benefits of cross-linked type I collagen with the volume and radiopacity of highly purified ß-TCP granules.[16]

Configuration Benefits:

- Excellent carrier for BMA
- Bends to conform to uneven surfaces
- Maintains postoperative graft volume

Putty

Moldable putty has the cell-binding benefits of type I collagen and the volume and radiopacity of highly purified ß-TCP granules.

Configuration Benefits:

- Versatile with excellent handling
- Optimal for placement in irregularly shaped defects

BONESYNC

BoneSync™ Putty and Strips

Compression Resistance

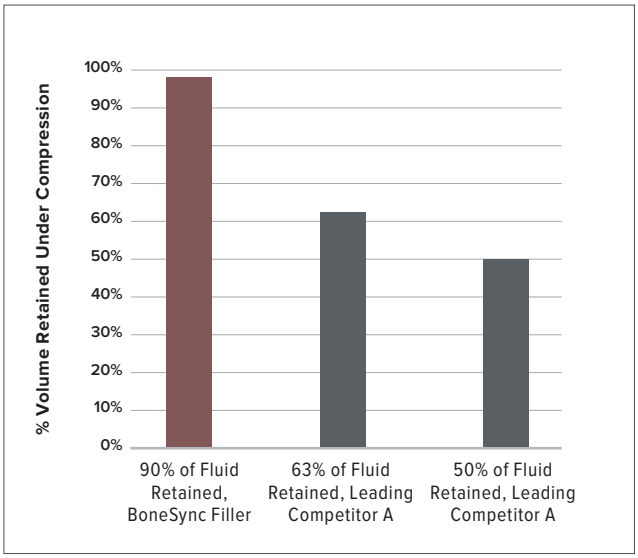
The framework of ß-TCP and cross-linked type I collagen in BoneSync putty and strips resists compression and maintains the structure of the material.[17] This configuration has fixed dimensions but is also flexible, conforming to uneven surfaces, for various applications in the skeletal system.

- Retains BMA within the matrix, facilitating bone fusion
- Maintains graft volume under compression

Compression-Resistant Matrix

A matrix with compression resistance has an increased ability to retain BMA and its active cells.

Fluid Retention Under Compression[18]

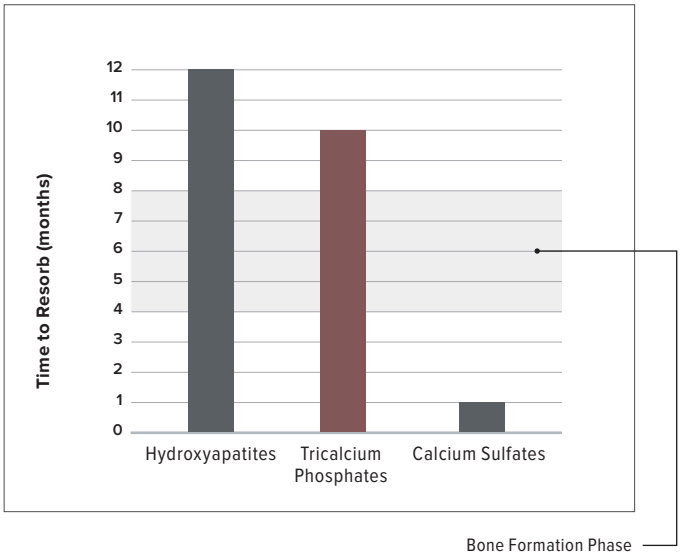


Resorption Profile Consistent With the Formation of New Bone

The residence time of an osteoconductive strip is a crucial factor for bone healing. A relatively short resorption profile often results in limited or weak bone growth, while longer residence time often results in ineffective tissue incorporation.

The composition and microarchitecture of the ß-TCP component of BoneSync putty and strips is engineered to support the replacement of the graft material by new bone.[19]

ß-TCP vs Competing Graft Components[19]



BONESYNC

BoneSync™ Putty and Strips

Clinical Evidence

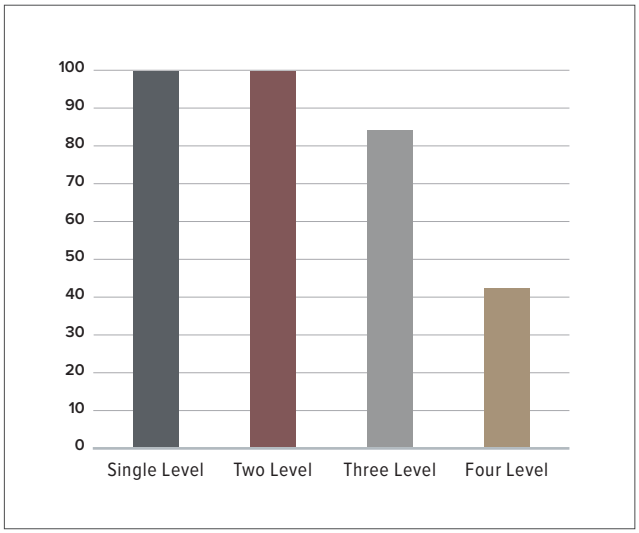
A BoneSync equivalent osteoconductive scaffold demonstrated fusion rate that was equivalent to autograft in a retrospective study on posterolateral lumbar fusion. This clinical study, which included patients with common comorbidities such as smoking, diabetes, and osteoporosis, found 100% fusion in all single- and two-level procedures, with an overall fusion rate of 90%. No significant differences were observed for the fusion scores in patients that received putty versus strip.[15]

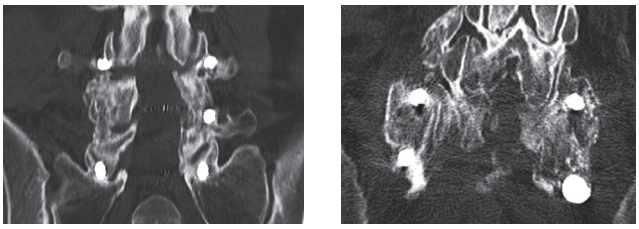
- Fusion rates for BoneSync equivalent scaffold equivalent to autograft
- Success in a patient population containing common comorbidities including smoking, diabetes, and osteoporosis
- In cases of successful fusion, definitive, uninterrupted bridging of well-mineralized trabecular bone observed 12 months after surgery, as determined by an independent radiologist blinded to treatment
- BoneSync equivalent scaffold applied as indicated with BMA alone, no addition of autograft or allograft
- Spinal fusion comparisons performed in each patient individually; the BoneSync equivalent scaffold applied to the symptomatic side and autograft to the contralateral side

Clinical Performance – 90% Overall Fusion[15]

Fusion rates were equivalent to autograft, including the ability to achieve fusion in 100% of single- and two-level procedures.

Fluid Rates in Multi-Level Procedures



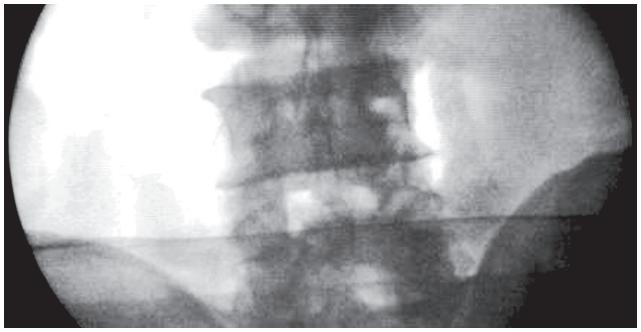


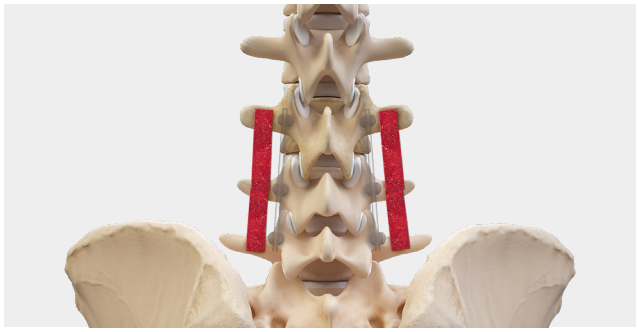
Representative radiographs from the referenced study.[15] CT scans from two patients at 12 months post-op.

Diverse Configurations

The ß-TCP component of BoneSync filler is engineered with a porosity level that balances radiopacity, residence time, and structure. An extremely porous graft material will likely limit radiopacity and structure, while an extremely dense material will likely limit graft incorporation into natural tissue.

- Provides radiographic visualization of graft placement
- Indicates active resorption during healing

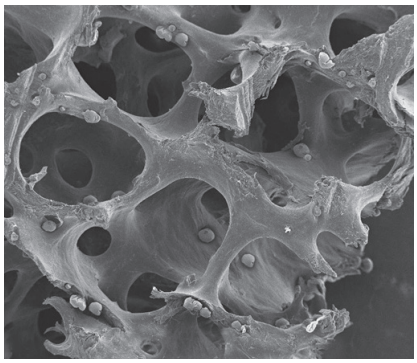




BONESYNC

BioSurge™ Cell and Bone Graft Processing System

The Arthrex BioSurge system combines the superior matrices of the AlloSync™ bone grafting solutions line with the Angel® system's proprietary technology to prepare customized platelet-rich plasma concentrate (cPRP) from BMA. Hydrated AlloSync bone grafts provide the optimal scaffold for cPRP from BMA, which is a rich source of platelets and nucleated and progenitor cells.



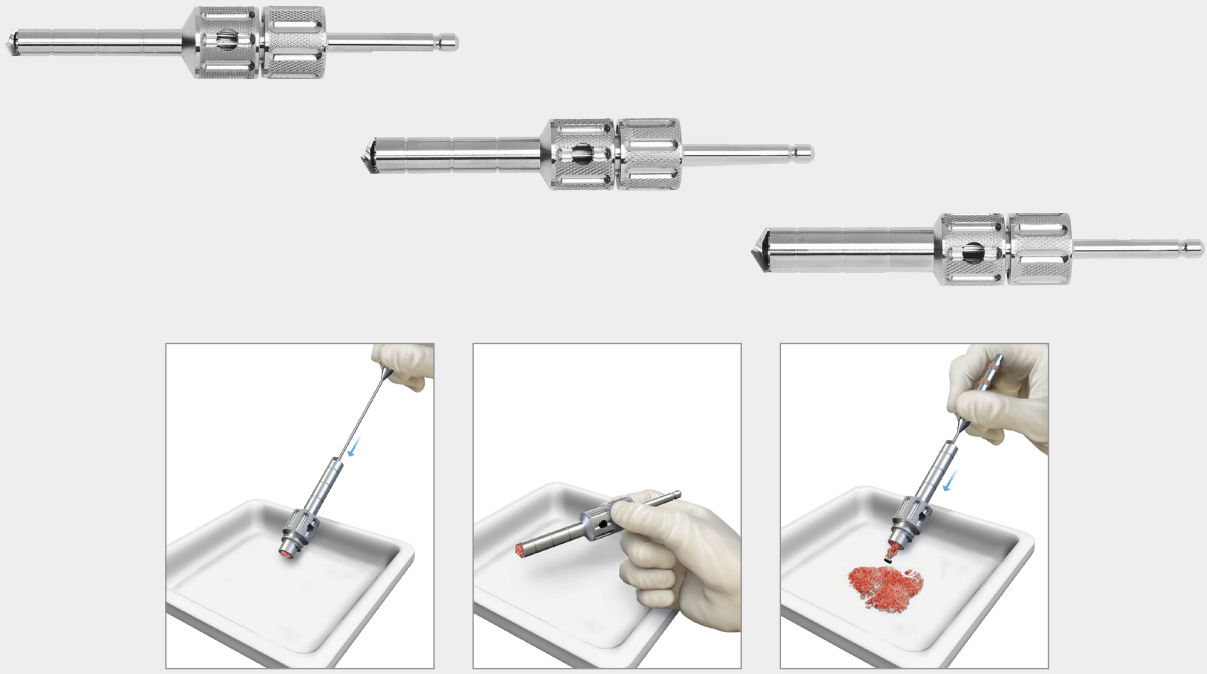
Electron microscopy image showing several healthy cells attached to the AlloSync bone graft scaffold after hydration.

Hydrated AlloSync bone graft with cPRP.

BioSurge system includes AlloSync and Angel system components.

BioSurge
Cell & Bone Graft Processing System

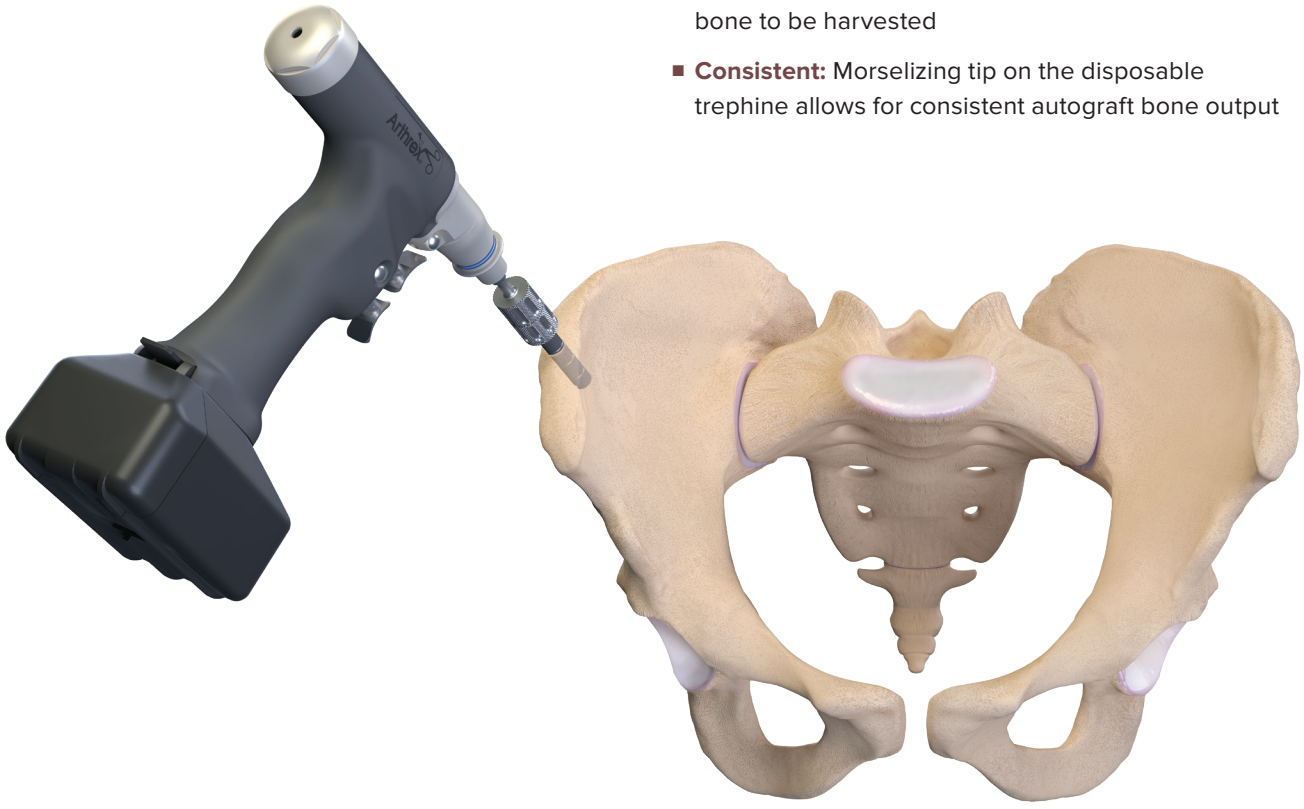
OsteoAuger™ Bone Graft Harvesting System



The OsteoAuger bone graft harvesting system allows for the quick and efficient recovery of morselized autogenous bone graft. Its simple design uses two separate compartments for the drill and morselized bone. This user-friendly design makes harvesting and reimplantation faster and more convenient.

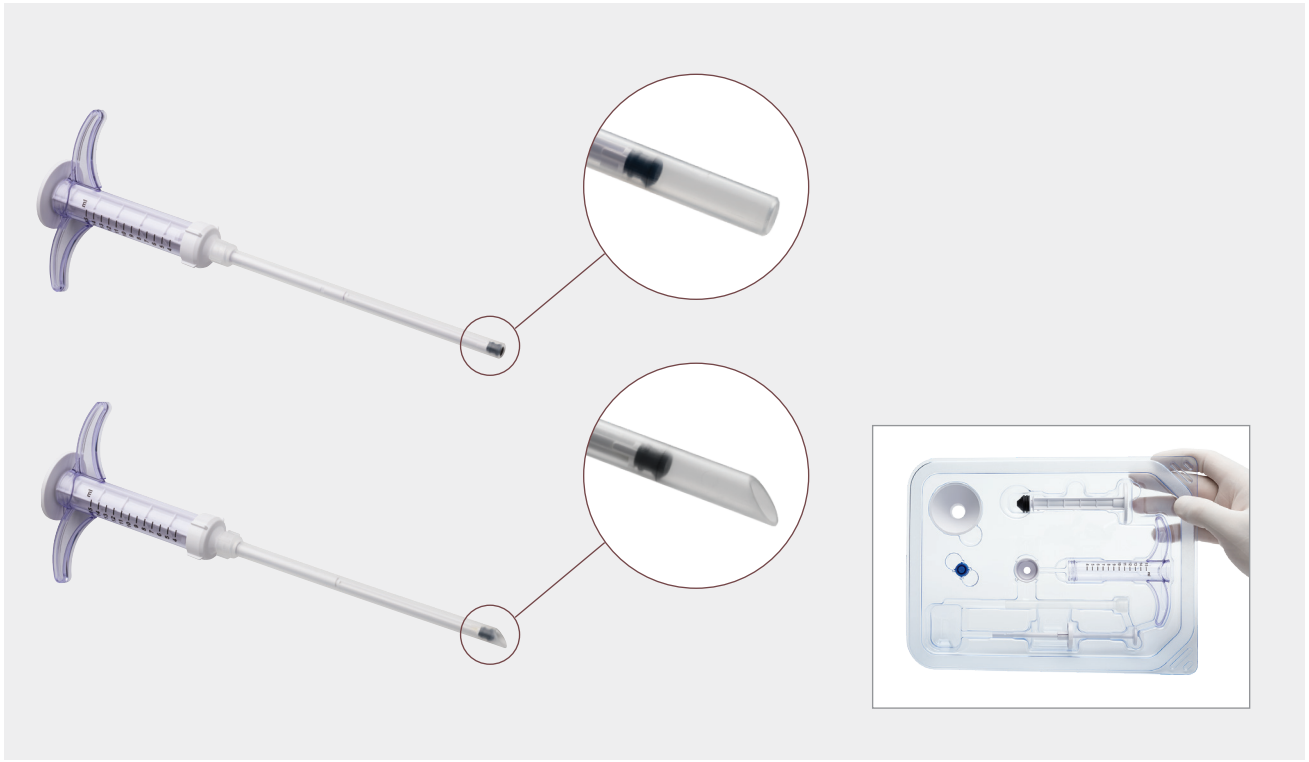
Features and Benefits:

- **Effective:** Autograft bone has long been acknowledged as the gold standard graft for fusion
- **Minimally invasive:** Small incision prevents patient discomfort and harvest site morbidity
- **Precise:** Three drill sizes allow predefined amounts of bone to be harvested
- **Consistent:** Morselizing tip on the disposable trephine allows for consistent autograft bone output



Bone Repair Accessories

BioXpress™ Graft Delivery Device



The BioXpress graft delivery device is designed for targeted delivery of hydrated allograft, autograft, or synthetic bone graft materials to an orthopedic surgical site, while maximizing material utilization.

Features and Benefits

- Dual plunger for loading the arthroscopic canula with the graft and unloading into the desired location
- Targeted delivery with flat and tapered tips
- Ensures maximum material utilization

BioXpress™

GraftNet™ Autologous Tissue Collector

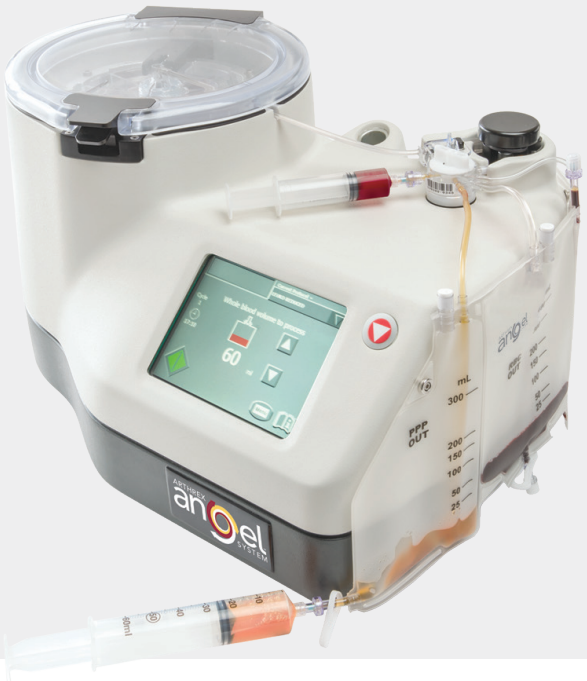
The suction-activated GraftNet device is designed to collect autologous bone from the surgical site and can be used for a multitude of applications, including spine, cranial, orthopedic, oral and maxillofacial, and foot and ankle. The small, inline device allows for maximum harvesting of autologous bone chips generated using a high-speed burr and collected through a connected suction tip, such as a Frazier suction. This recovered autologous bone is collected in an easily accessed, sterile filtered chamber. The GraftNet autologous tissue collector makes recovering and gaining access to autologous bone chips as simple as Resect and Collect™.

- Universal adapters make for easy attachment to common suction devices
- Maximize autologous bone collection
- Quickly access recovered tissue
- Increase opportunity for arthrodesis success with maximum autograft volume

GraftNet™
AUTOLOGOUS TISSUE COLLECTOR

Autologous Blood Products

Arthrex Angel® cPRP and Bone Marrow Processing System



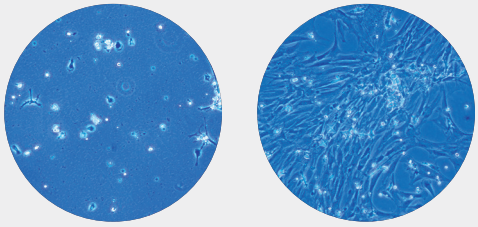
Arthrex Angel cPRP and BMA Tray

Arthrex Angel cPRP and Powered BMA Kit

Technology is what sets the Angel cPRP system apart from the competition. The Angel cPRP and bone marrow processing system uses proprietary sensor technology and one-button automation to deliver customized PRP concentrate. The Angel cPRP system is the only device that can provide cPRP from BMA with adjustable cellular levels. Bone marrow is a rich source of platelets, nucleated cells, and progenitor cells.

- Proprietary platelet sensor system
- Adjustable platelet concentrations
- Adjustable white blood cell (WBC) concentrations
- Programmable—can store up to 30 custom processing protocols
- Each processing kit can process 3 cycles of up to 180 mL on the same patient
- Flexible processing volume, 40 mL to 180 mL
- Closed system; delivers PRP, platelet-poor plasma (PPP), and red blood cells (RBCs) into separate, sterile compartments

In vitro culture expansion of progenitor cells over 96 hours



48 hours

96 hours

ARTHREX angel SYSTEM™

Arthrex Angel® cPRP and Bone Marrow Processing System

High-specificity 3ST light sensor technology

Advantages of 3-Sensor Technology (3ST):

- No syringe switching
- No manual steps to prepare PRP
- Delivers PRP, PPP, and RBCs into separate, sterile compartments
- Ability to modulate platelet, leukocyte, and RBC content
- Consistent PRP output

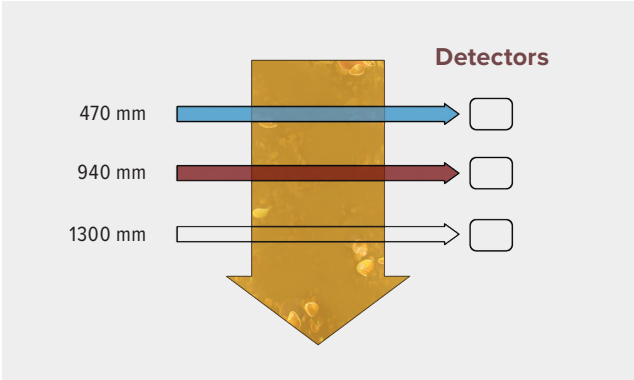
High-specificity 3ST light sensor technology and automated valve actuation are the foundation of the Arthrex Angel cPRP System. The results of these features are the production of a high yield of PRP and PPP from whole blood.

3-Sensor Technology

The Angel system incorporates three sensors to accurately separate blood components using cell-specific wavelengths of light to increase cellular yields. Absorption of 470 nm light detects platelets and leukocytes, 940 nm detects erythrocytes, and the 1300 nm wavelength corrects for ambient light and the presence of air bubbles.

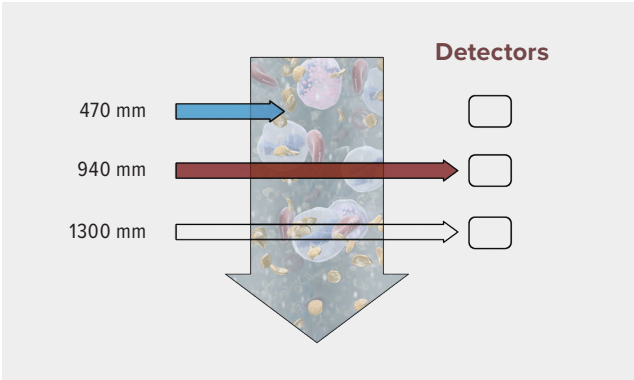
ARTHREX angel™ SYSTEM

Arthrex Angel® cPRP and Bone Marrow Processing System



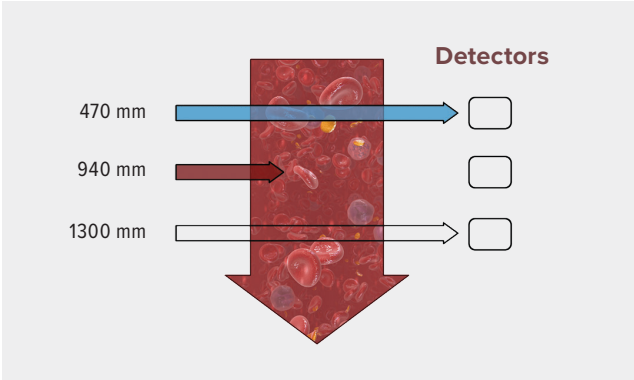
Plasma

When plasma is present, all three light beams pass through and contact the detector. The Angel device recognizes the presence of plasma and turns the valve to collect PPP. The PPP is deposited in the PPP collection reservoir.



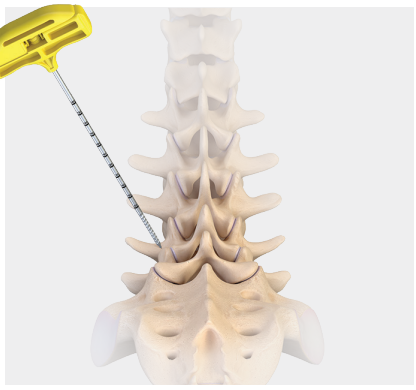
Platelets and Nucleated Cells

When platelets and nucleated cells are present, the 470 nm wavelength of light is absorbed. The absence of the 470 nm beam on the detector alerts the Angel system to stop collecting PPP. The Angel system will then actuate the valve to collect PRP. The PRP is directed into the collection syringe on top of the unit.

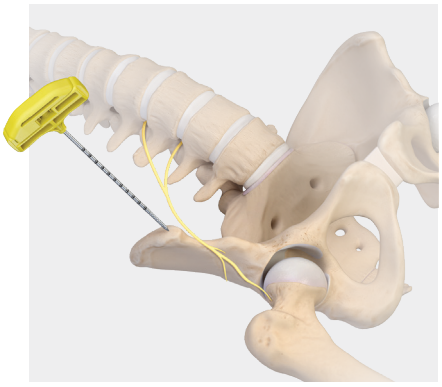


RBCs

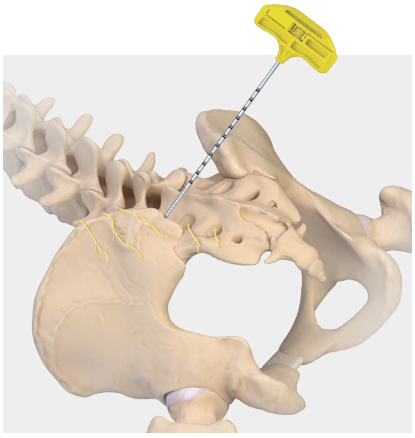
The 940 nm wavelength is absorbed by RBCs. When the detector no longer detects the 940 nm beam, the Angel system will allow a percentage of RBCs to pass through into the PRP collection syringe. The percentage of RBCs collected in the PRP syringe is determined by the hematocrit (HCT) setting selected by the operator.



Bilateral Vertebra Body
Harvest Technique



Anterior Superior Iliac Spine (ASIS)
Harvest Technique



Posterior Superior Iliac Spine (PSIS)
Harvest Technique

ARTHREX angel™ SYSTEM

Vortex™ Threaded Recovery Needle

To continue its mission of Helping Surgeons Treat Their Patients Better™, Arthrex has introduced the Vortex threaded recovery needle* for BMA recovery. The unique design, featuring a threaded tip and vent holes, allows the user to easily and accurately reposition the tip of the needle within the bone for optimal aspiration volume.

Designed for precise depth and directional control while aspirating bone marrow, the Vortex needle allows the user to maximize the concentration of osteoprogenenitor cells recovered from the patient.[20]

Features and Benefits

- Precise depth control

Technical Pearls

- To maximize the concentration of osteoprogenitor cells collected, it is recommended to change the depth of the needle after every aspiration of 2 cc of bone marrow. This is done by completing alternating ½ and 1½ turns of the needle.
- The use of a C-arm is recommended to assist with proper targeting

*Patent pending

VORTEX
Threaded Recovery Needle

Arthrex ACP® Double-Syringe System

Arthrex ACP
Double-Syringe
System

- The Arthrex ACP (autologous conditioned plasma) system allows for rapid and efficient concentration of platelets and growth factors from autologous blood for use at the treatment site
- The unique double-syringe design allows for convenient and safe handling, as the whole preparation process takes place in a closed system
- The Arthrex ACP system is affordable, easy to use, and has a quick procedure time when compared to other PRP devices[21]
- White blood cells, specifically neutrophils, are NOT concentrated within the ACP system. These cells can be detrimental to the healing process due to release of degradative proteins and reactive oxygen species[22,23]

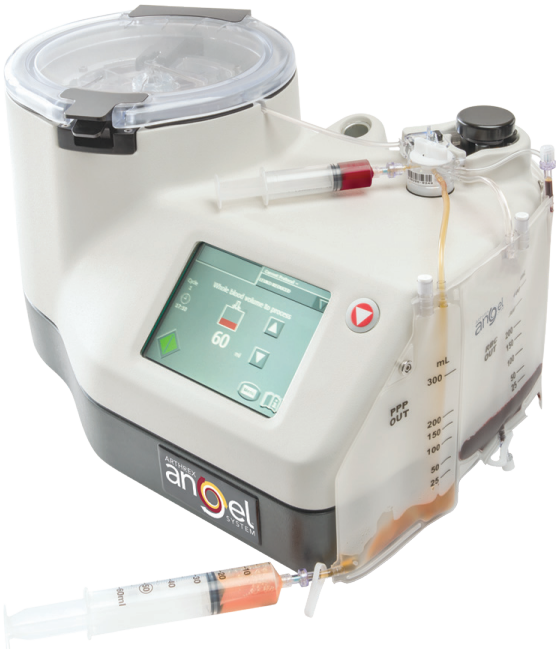
Rotor Set With Buckets

Arthrex ACP System
Cart and Centrifuge

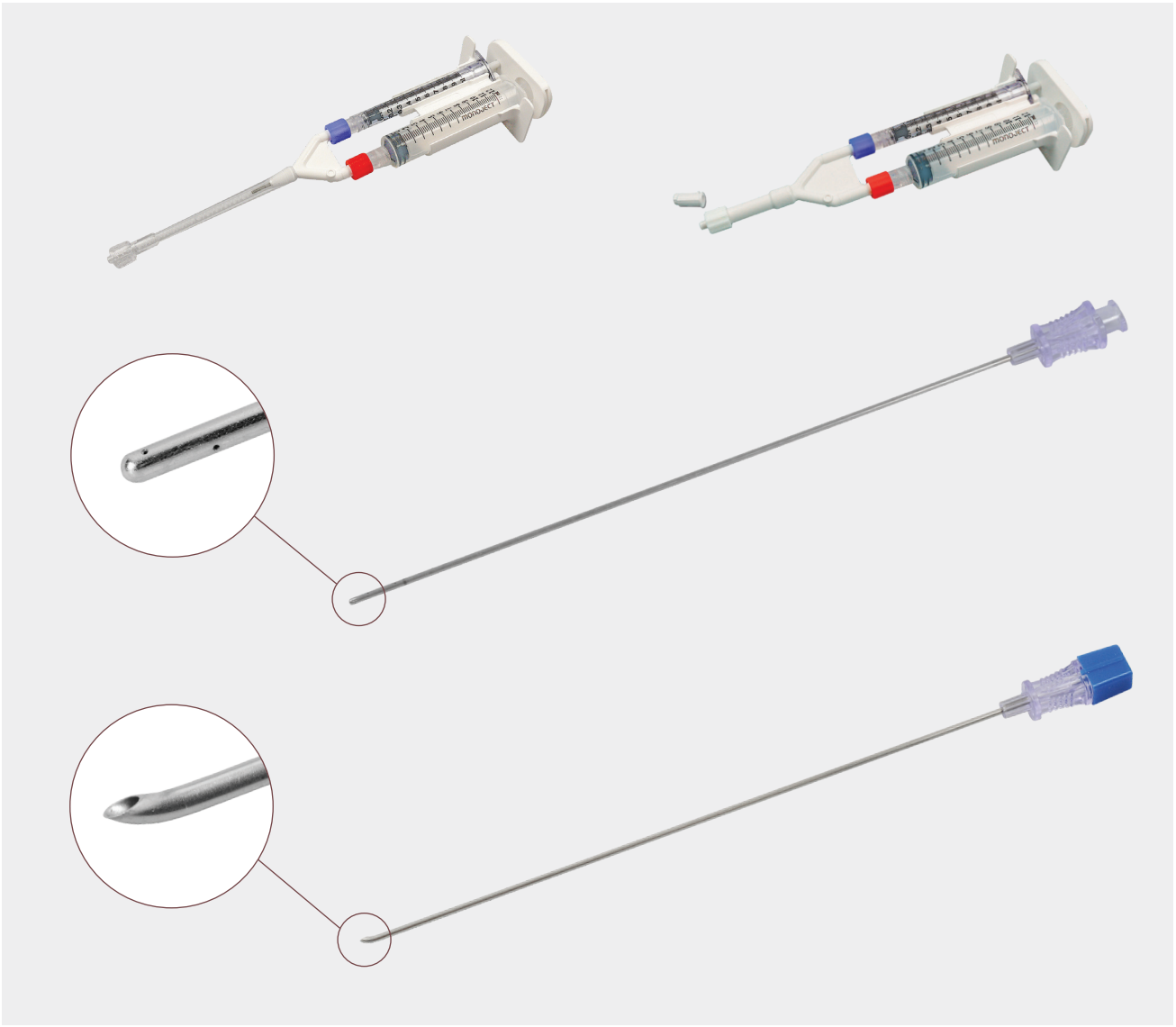
Thrombinator™ System for Use With the Angel® cPRP System

The Thrombinator system for use with the Angel cPRP system is designed to produce an autologous activation serum at the point of care. The serum produced by the Thrombinator system can be used to improve the handling of bone grafts hydrated with cPRP. Autologous activation serum improves handling by activating platelets to produce a gel that serves as a binding agent for bone graft material. The Thrombinator process uses the principles of the clotting cascade to produce an activation serum without the use of harsh chemical reagents such as ethanol. The Thrombinator design eliminates the need for lengthy incubation times and heating requirements. Autologous activation serum can be produced in less than 20 minutes from peripheral whole blood (WB) or PPP at the point of care.

- Rapid preparation, less than 20 minutes
- Prepare from WB or PPP
- Produces clot in as little as 15 seconds
- Centrifugation not required



Viscous Delivery Systems

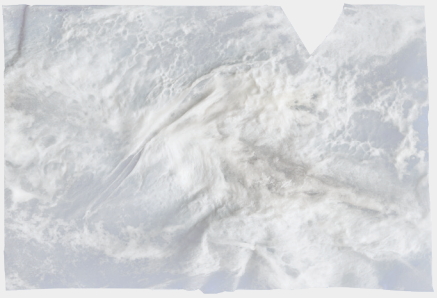


- Quick and simple to attach and detach
- Easy to fill—no need to disassemble
- 11:1 ratio allows homologous mixture of two fluids
- Use to provide a low- or high-viscosity fluid
- ACP or PRP can be mixed with allograft or autograft bone prior to application to an orthopedic surgical site as a spray, gel, or clot
- Extra long, blunt, fenestrated, and beveled delivery needles

Soft-Tissue Repair

Arthrex Amnion™ Matrix

Arthrex Amnion Matrix, Thin



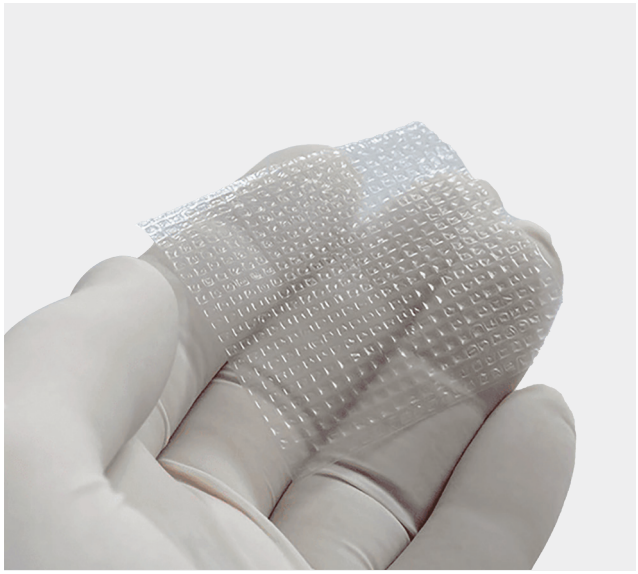
Arthrex Amnion Matrix, Thick

Amniotic-derived tissues contain endogenous growth factors and cytokines[24-27] that maintain the natural properties of amnion. Arthrex Amnion matrix is an anatomical barrier that helps provide mechanical protection[28] while supporting tissue with nutrient-rich growth factors.[29-31]

- Amniotic membrane is a thin, semitransparent, and resilient membrane that lines the inner cavity of the placenta
- With over 100 years of clinical history,[26] the functional capability of amniotic membrane is well documented
- Just as amniotic tissue protects and cushions the fetus during development, Arthrex Amnion matrix helps provide the same support to damaged tissue[27]
- Arthrex Amnion matrix harnesses growth factors essential for signaling[27,30]

Arthrex AMNION Matrix

Biovance® Amniotic Membrane Allograft



Biovance human amniotic membrane allograft is derived from the placenta of a healthy, full-term pregnancy. Unlike other placenta-derived allografts, Biovance amniotic membrane is completely decellularized, devoid of cells, hormones, growth factors, cytokines, and other substances. Biovance amniotic membrane acts as a barrier membrane during the wound regeneration process and supports tissue growth. It contains key extracellular matrix proteins that allow for the migration of host cells to permeate the graft and promote tissue repair.

Features and Benefits:

- Flexible to use across a wide variety of applications
- Biologic membrane supports the body's healing process
- Room temperature storage
- Non-side-specific
- Available in multiple sizes for a variety of surgical application needs
- 10-year shelf life

Applications

- Surgical covering
- Wrap or barrier
- Partial- and full-thickness acute and chronic wounds, such as traumatic and complex wounds, burns, surgical sites, and Mohs surgery sites
- Diabetic, venous, arterial, pressure, and other ulcers
- Wounds with exposed tendon, muscle, bone, or other vital structures

BIOVANCE®
Human Amniotic Membrane Allograft
A Celularity Innovation

CentaFlex™ Placental Matrix

CentaFlex decellularized human placental matrix allograft is derived from human umbilical cord. CentaFlex placental matrix has the strength to support repair, without the trade-off of an overly thick tissue. It serves as a cell-friendly structure to allow noninflammatory cell attachment, proliferation, and growth. CentaFlex placental matrix can be quickly hydrated with a sterile fluid for maximum flexibility and easy handling, and it is terminally sterile.

Features and Benefits

- Robust and strong to hold a suture
- Available in multiple sizes for a variety of surgical application needs
- Flexible to use across a wide variety of applications
- Non-side-specific
- Room temperature storage
- 10-year shelf life

Applications

- Surgical covering
- Wrap or barrier
- Partial- and full-thickness acute and chronic wounds, such as traumatic and complex wounds, burns, surgical sites, and Mohs surgery sites
- Diabetic, venous, arterial, pressure, and other ulcers
- Wounds with exposed tendon, muscle, bone, or other vital structures

CentaFlex™
Human Placental Matrix

Interfyl® Connective Tissue Matrix

Interfyl connective tissue matrix is used to fill irregular spaces or soft-tissue deficits resulting from wounds, trauma, or surgery. Derived from the placenta of a healthy, full-term pregnancy, Interfyl connective tissue matrix is suited for a variety of surgical applications when there is a need to replace or supplement damaged or inadequate integumental tissue. It is minimally manipulated and retains the fundamental structure and functional characteristics of connective tissue, and is available in particulate and flowable formulations.

Features and Benefits

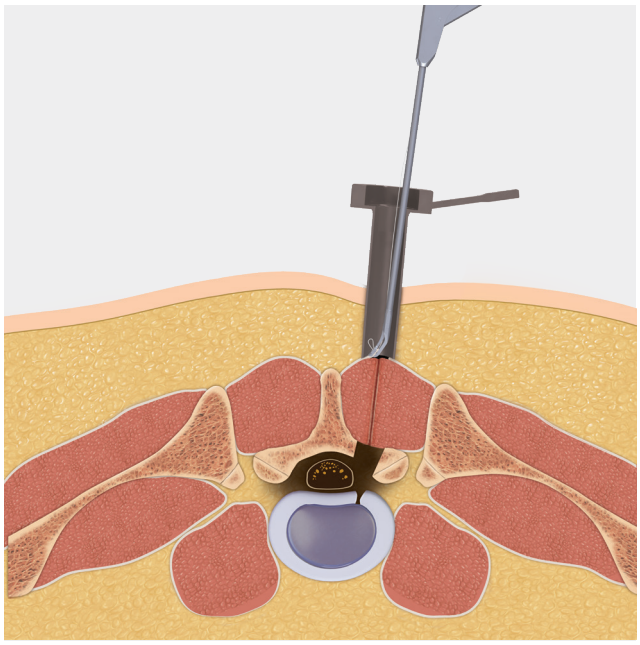
- Flowable and particulate formulations
- Conforms to irregular surfaces
- Room temperature storage
- 10-year shelf life

Applications

- Augmentation of deficient or inadequate soft tissue and treatment of deep dermal wounds
- Surgical wounds
- Soft-tissue voids as a result of tunneling wounds, fistula tracts, or dermal undermining, including those with exposed vital structures (bone, tendon, ligament, or nerve)

Interfyl®
Human Connective Tissue Matrix
A Celularity Innovation

Spine Scorpion™ Suture Passer

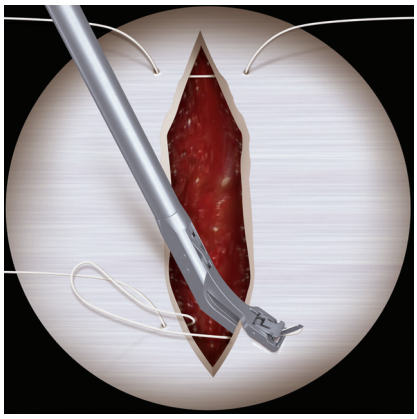


The Spine Scorpion suture passer draws on Arthrex's over 20 years of experience in the minimally invasive suture market. Designed specifically for minimally invasive spine approaches, the Spine Scorpion suture passer removes the frustration associated with closing the fascia at the end of the case.

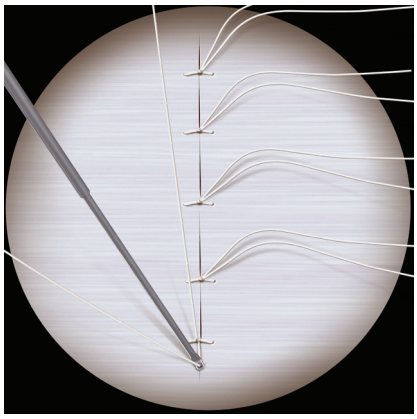
The Spine Scorpion suture passer is ideal for closing the fascia at the end of minimally invasive spine procedures. The low-profile design allows for easy access to the fascia, at all depths, for procedures done through either a tubular or mini open approach. The Spine Scorpion suture passer automatically passes and retrieves multiple types of suture, including 0 and 2-0 sutures.

Features and Benefits

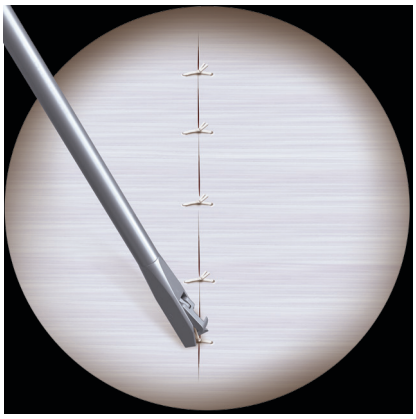
- Efficient, consistent fascia closure at any depth
- Automatically and seamlessly passes and retrieves suture
- One-step suture loading
- Low-profile design for easy access through tubular or mini open approaches



Pass...



Tie...

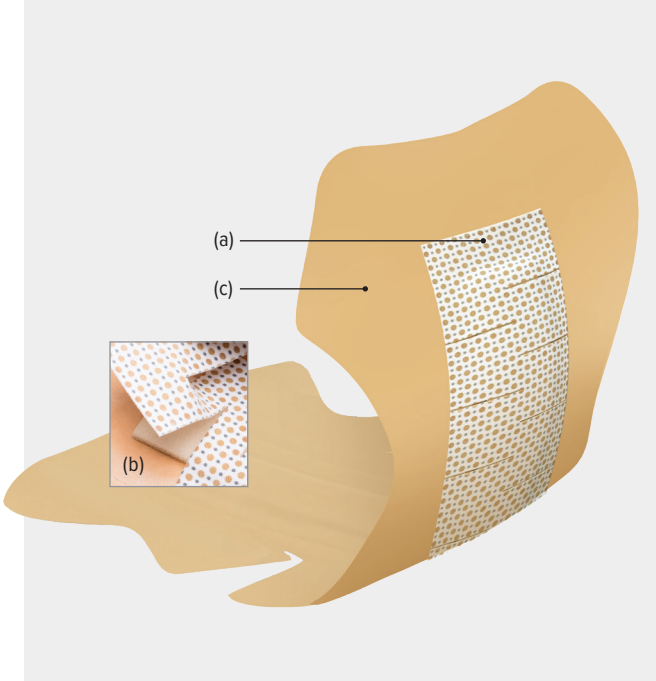


Cut.

Spine Scorpion

Wound Care

JumpStart® Antimicrobial Wound Dressings



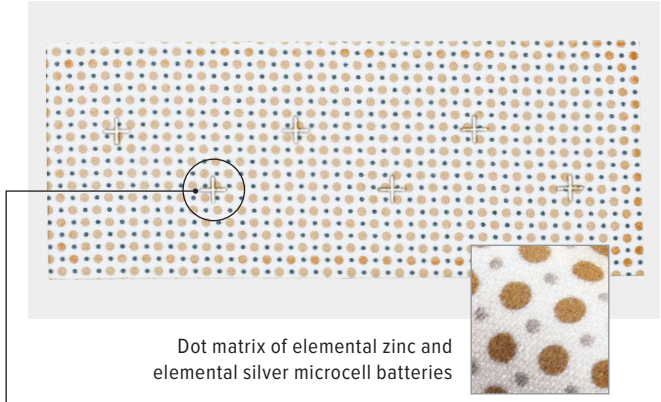
- JumpStart dressing wound contact layer powered by V.Dox technology (a)
- Highly absorbent middle layer (b)
- Adhesive dressing‡ (c)

‡Two adhesive layer options, tegaderm and acrylic, are offered to meet diverse patient needs.

JumpStart Dressings Powered by V.Dox™* Technology

JumpStart dressings are provided on an ultra-thin, lightweight, polyester substrate and contain laser-cut fenestrations to allow easy passage of wound exudate into the absorbent layer or a secondary dressing. The flexible design easily contours to the body. JumpStart dressings may be applied directly over sutures, staples, Steri-Strips™†, and liquid skin adhesives. The dot matrix pattern of embedded microcell batteries generate microcurrents on the dressing surface in the presence of a conductive medium, such as sterile saline, water-based gel, or wound exudate.

- Polyester substrate with embedded microcell batteries made of elemental silver and elemental zinc
- Fenestrations allow wound drainage to pass through dressing to absorbent layer
- Water resistant (may be left in place while showering)
- Omnidirectional stretch for enhanced mobility and comfort



Dot matrix of elemental zinc and elemental silver microcell batteries

JumpStart Contact Layer Dressing

- JumpStart's antimicrobial wound contact layer powered by V.Dox technology
- Polyester substrate with embedded microcell batteries made of elemental silver and elemental zinc
- Fenestrations allow wound drainage to pass through dressing to absorbent layer

*V.Dox is a trademark of Vomaris Innovations, Inc.
†Steri-Strip is a trademark of 3M.

V·DOX™ TECHNOLOGY

JumpStart ANTIMICROBIAL WOUND DRESSING

Energel® Wound Hydrogel

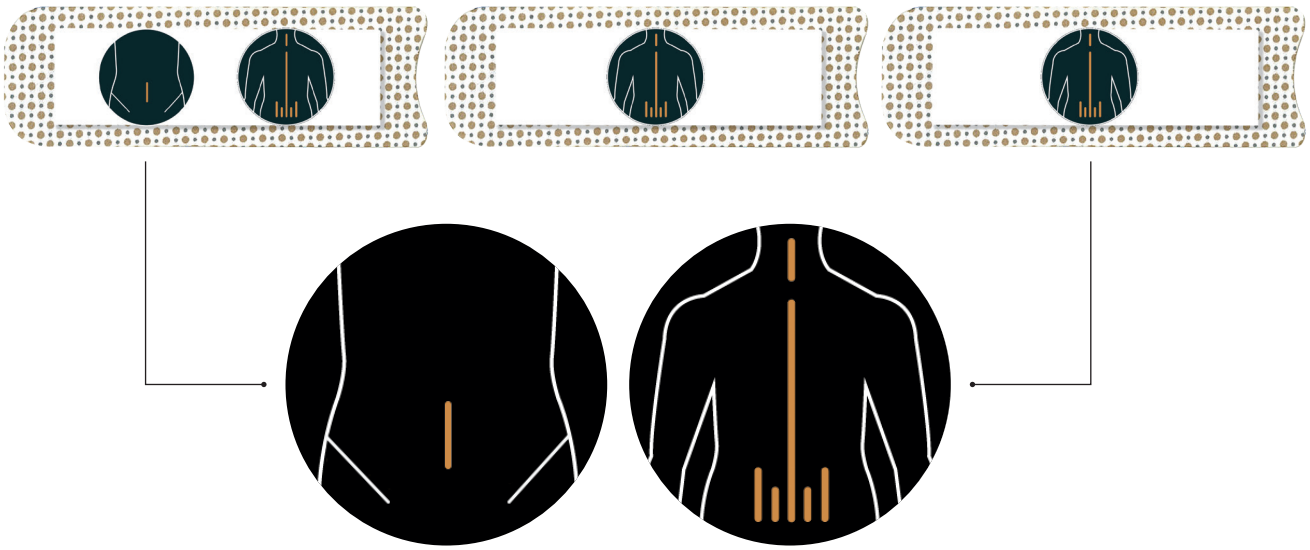
Use Energel wound hydrogel to activate JumpStart® dressing's microcell batteries:

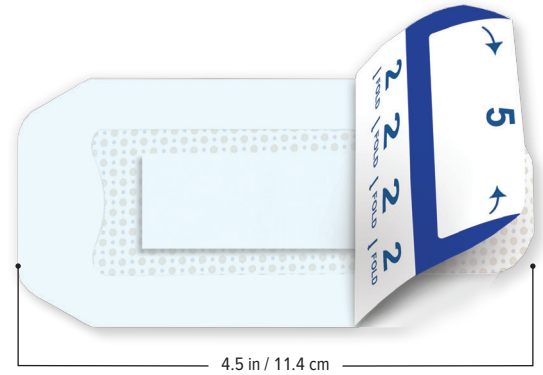
- Sterile, water-soluble gel formulated to maintain a moist wound environment and provide moisture to a dry wound
- Double-packaged sterile for use in the operating room
- Optimally sized for single use (7.5 g)
- Maintains conductivity of JumpStart dressing for up to 7 days

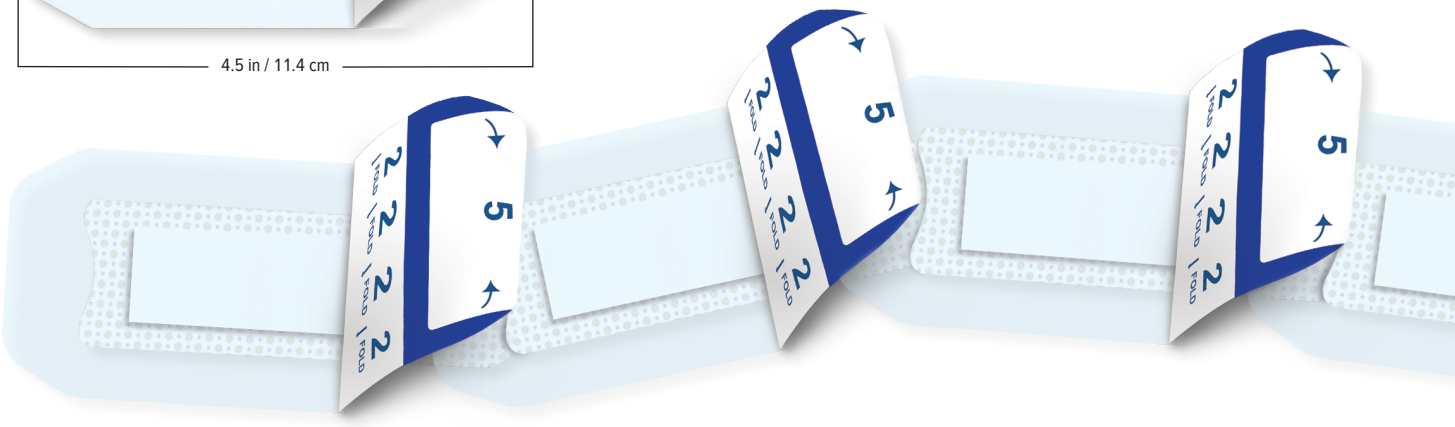
JumpStart® FlexEFit® Antibacterial Wound Dressing

JumpStart FlexEFit Wound Dressing's Exclusive "Link and Build" Design

JumpStart FlexEFit antibacterial wound dressing employs a novel link and build design that enables it to be "built" during application to seamlessly cover incisions of virtually any length or curvature with just one product configuration.







*JumpStart FlexEFit dressing applications are not limited to the examples shown.

V•DOX™ TECHNOLOGY

JumpStart® FlexEFit™

JumpStart® FlexEFit® Antibacterial Wound Dressing

Description

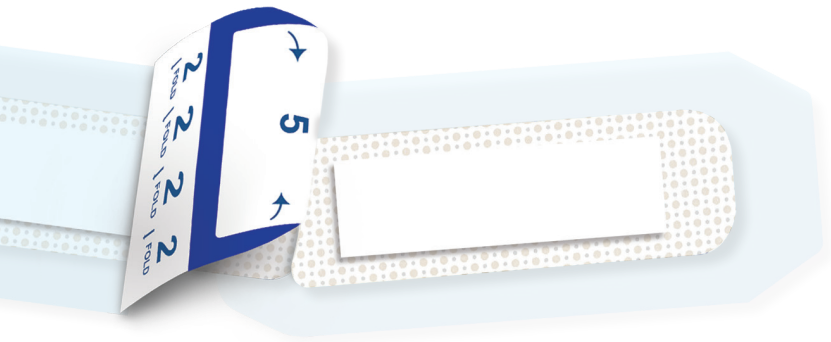
- JumpStart FlexEFit antibacterial wound dressing is designed with the flexibility to fit virtually any incision length or curvature
- The dressing is powered by patented V.Dox™ technology, the only nonantibiotic, antibacterial technology that is inspired by the skin's natural electrical healing process
- Embedded microcell batteries in the dressing generate an electric field designed to mimic the skin's physiologic electric fields, which are essential for cell migration and healing

Antibacterial Impact

- Demonstrated antibacterial impact against a broad spectrum of bacteria, including multidrug-resistant and biofilm-forming bacteria[31-33]
- Designed to minimize infection risk and support the body's natural healing process

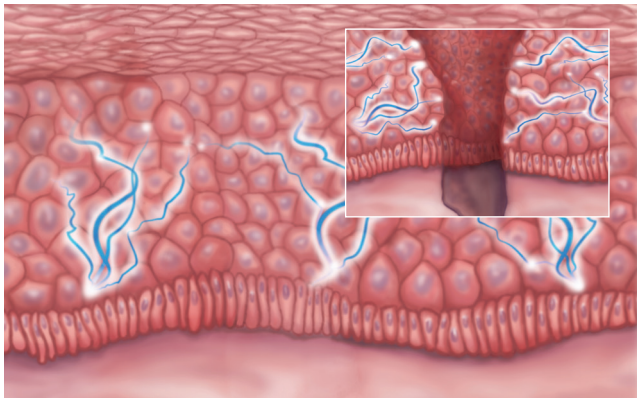
Features and Benefits

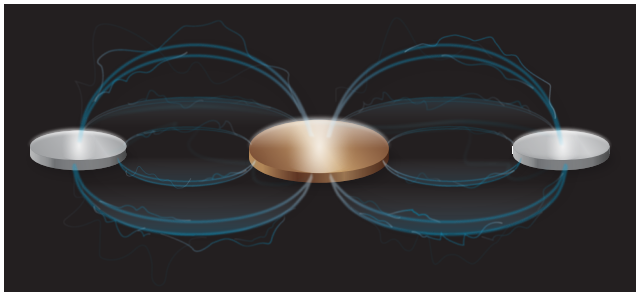
- Water resistant (may be left in place while showering)
- One-of-a-kind antimicrobial technology
- Daisy chain design
- 7-day wear time

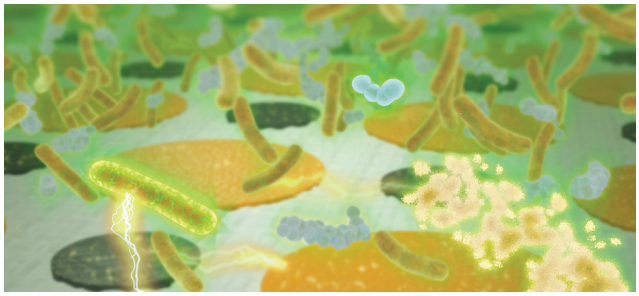


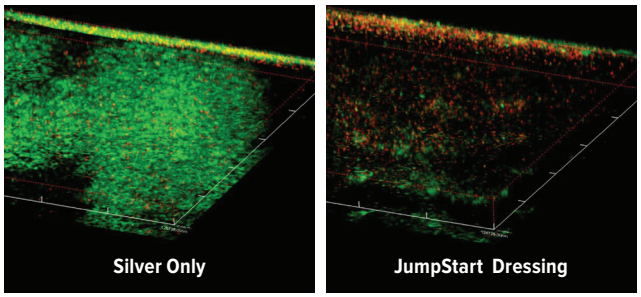
Order a single product to meet postsurgical dressing needs.

The Science of JumpStart® Wound Dressings

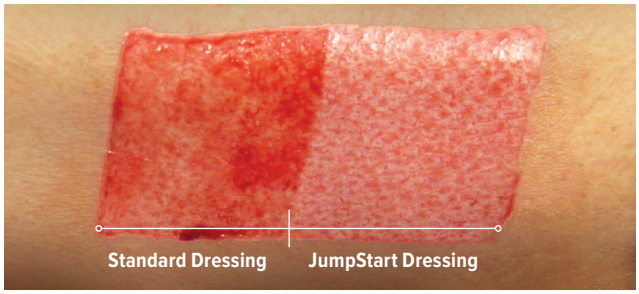








Live/dead fluorescence staining demonstrated bacterial killing of *P. aeruginosa* within JumpStart antimicrobial wound dressing compared to a standard silver-based dressing at 24 hours. Green = alive, Red = dead.



Prospective case series; skin graft harvest sites (N=13) demonstrated significantly greater re-epithelialization with JumpStart dressing (71.8%) vs control (46.9%) (P = .015).

Inspired by the body.

The skin naturally creates and uses electrical energy to promote healing. Electric fields in the skin create surface energy potential, known as transepithelial potential (TEP). When skin is wounded, a change in electric potential occurs, which drives the cell migration and wound healing process.

Powered by electricity.

JumpStart antimicrobial wound dressings – powered by patented V.Dox™ technology – employ moisture-activated microcell batteries that wirelessly generate microcurrents designed to mimic the skin's electrical energy.

Energized by results.

JumpStart dressings reduce the risk of infection by killing a broad spectrum of bacteria without antibiotics while supporting the body's natural healing process.

Published studies show JumpStart dressings reduce the risk of infection[31-35] and promote the healing process[36] to optimize outcomes.

Reduce risk of infection

- Killed a broad spectrum of pathogens, including multi-drug-resistant and biofilm-forming bacteria[31-33]
- Disrupted existing biofilm infection and prevented biofilm from forming in preclinical studies[34]
- Prevented bacterial growth, with sustained antimicrobial impact for up to 7 days[35]
- Demonstrated electricidal antimicrobial impact versus silver dressings[32]

Promote healing

Improved re-epithelialization with JumpStart dressings versus standard dressings[36]

V·DOX™ TECHNOLOGY

JumpStart® ANTIMICROBIAL WOUND DRESSING

The Science of JumpStart® Wound Dressings

Surgical site infections (SSI) occur in **1% to 2%** of all patients worldwide undergoing inpatient surgery[37-39]

SSIs affect **millions** of patients each year
US: 1.5 million[40]
Europe: 500,000[38]

SSIs increase annual treatment costs
US: +$3.5 to $10 billion[41]
Europe: +€1.5 to €19 billion[42]

SSIs prolong hospitalization
US: +9.7 days[41]
Europe: +6.5 days[42]

3% **estimated mortality rate with SSI[40]**

75% **of SSI-associated deaths are directly attributable to the infection[40]**

50% **of SSIs are preventable[37,43-44]**

Not Just a Postoperative Dressing

Bioelectric dressings have demonstrated benefits when applied preoperatively, in addition to as part of routine postoperative care.

- When applied 2 hours before the development of an acute wound, bioelectric dressing can prevent biofilm formation[34]
- JumpStart dressing has been shown to be equally as effective in preventing bacteria formation as traditional skin preparation products[45]
- When used both pre- and postoperatively, JumpStart dressing can provide enhanced antibacterial protection to wound sites

Evidence for Successful Use in Spine

- Retrospective hospital-registry study
- SSIs persist as a leading complication of spinal fusion surgery[46]
- The majority (57.5%) of infections studied were resistant to the prophylaxis administered during the procedure[46]
- There is an anatomic gradient in the microbiology of spinal fusion surgical site infection
- Bacteria gradient along the spine:
  - Gram-positive: cervical spine
  - Gram-negative: lumbar spine
- JumpStart dressing kills and protects against both gram-positive and -negative bacteria[46]

Antimicrobial Impact of JumpStart® Wound Dressings

Pathogens	Antimicrobial Impact
Acinetobacter baumannii	✔
Acinetobacter calcoaceticus	✔
Aspergillus niger	✔
Candida albicans	✔
Corynebacterium amycolatum	✔
Corynebacterium xerosis	✔
Cutibacterium acnes	✔
Enterobacter aerogenes	✔
Enterobacter cloacae	✔
Enterococcus faecalis	✔
Escherichia coli	✔
Klebsiella pneumoniae	✔
Pseudomonas aeruginosa	✔
Serratia marcescens	✔
Staphylococcus aureus	✔
Staphylococcus epidermidis	✔
Staphylococcus simulans	✔
Streptococcus pneumoniae	✔
Trichophyton rubrum	✔

Biofilm-producing bacteria	Anti-Biofilm Impact
Acinetobacter baumannii	✔
Corynebacterium amycolatum	✔
Enterobacter aerogenes	✔
Enterococcus faecalis	✔
Escherichia coli	✔
Klebsiella pneumoniae	✔
Pseudomonas aeruginosa	✔
Staphylococcus aureus	✔
Staphylococcus epidermidis	✔
Serratia marcescens	✔

Antibiotic-resistant bacteria	Bactericidal Impact
Klebsiella pneumoniae (ESBL)	✔
Pseudomonas aeruginosa (MDR) Staphylococcus aureus (MRSA)	✔
Vancomycin-resistant Enterococcus raffinosus (VRE 510)	✔
Vancomycin-intermediate Staphylococcus aureus (NRS1, NRS12, NRS73, NRS116)	✔
Vancomycin-resistant Staphylococcus aureus (VRS1, VRS9, VRS11b)	✔

To learn more about JumpStart dressings with V. Dox™ technology, visit Arthrex.com or contact your Arthrex Technology Consultant.

V·DOX™ TECHNOLOGY

JumpStart ANTIMICROBIAL WOUND DRESSING

Bone Repair

ArthroCell™ Viable Bone Matrix

Product Description	Item Number
ArthroCell Viable Bone Matrix, 2.5 cc	ABS-**2009-02**
ArthroCell Viable Bone Matrix, 5.0 cc	ABS-**2009-05**
Mixing Delivery Syringe, 14 cc*	ABS-**2000**

*The mixing syringe is required to be ordered for each graft size.

AlloSync™ Expand Demineralized Cortical Fibers

Product Description	Item Number
AlloSync Expand, 1 cc	ABS-**2017-01**
AlloSync Expand, 2.5 cc	ABS-**2017-02**
AlloSync Expand, 5 cc	ABS-**2017-05**
AlloSync Expand, 10 cc	ABS-**2017-10**

AlloSync Pure Demineralized Bone Matrix

Product Description	Item Number
AlloSync Pure, 1 cc	ABS-**2010-01**
AlloSync Pure, 2.5 cc	ABS-**2010-02**
AlloSync Pure, 5 cc	ABS-**2010-05**
AlloSync Pure, 10 cc	ABS-**2010-10**

AlloSync Putty, Gel, and Paste

Product Description	Item Number
AlloSync DBM Putty	
Putty, 1 cc	ABS-**2012-01**
Putty, 2.55 cc	ABS-**2012-02**
Putty, 5 cc	ABS-**2012-05**
Putty, 10 cc	ABS-**2012-10**
AlloSync DBM Gel	
Gel, 1 cc	ABS-**2013-01**
Gel, 5 cc	ABS-**2013-05**
Gel, 10 cc	ABS-**2013-10**
AlloSync CB DBM Putty	
Putty, 5 cc	ABS-**2014-05**
Putty, 10 cc	ABS-**2014-10**
AlloSync CB DBM Paste	
Paste, 1 cc	ABS-**2015-01**
Paste, 3 cc	ABS-**2015-03**
Paste, 8 cc	ABS-**2015-08**

Cancellous Sponges

Product Description	Item Number
Cubes	
Cube, 8 mm × 8 mm × 8 mm	ABS-**2005-01**
Cube, 10 mm × 10 mm × 10 mm	ABS-**2005-02**
Cube, 12 mm × 12 mm × 12 mm	ABS-**2005-03**

Cancellous Sponges (Cont.)

Product Description	Item Number
Strips	
Strip, 10 mm × 10 mm × 3 mm	ABS-**2006-01**
Strip, 15 mm × 40 mm × 3 mm	ABS-**2006-02**
Strip, 26 mm × 19 mm × 7 mm	ABS-**2006-03**
Strip, 10 mm × 20 mm × 7 mm	ABS-**2006-04**
Chips	
Chips (1 mm-4 mm), 1.0 cc	ABS-**2007-01**
Chips (1 mm-4 mm), 2.5 cc	ABS-**2007-02**
Chips (1 mm-4 mm), 5 cc	ABS-**2007-03**
Cortical Fibers	
Fibers, 1.0 cc	ABS-**2008-01**
Fibers, 2.5 cc	ABS-**2008-02**
Fibers, 5 cc	ABS-**2008-03**
Fibers, 10 cc	ABS-**2008-04**

BoneSync™ Putty and Strips

Product Description	Item Number
BoneSync Putty	
Putty, 2.5 cc	ABS-**3202**
Putty, 5 cc	ABS-**3205**
Putty, 10 cc	ABS-**3210**
Putty, 15 cc	ABS-**3215**
BoneSync Strips	
Strip, 10 cc	ABS-**3310**
Strip, 15 cc	ABS-**3315**

BioSurge™ Cell and Bone Graft Processing System

Product Description	Item Number
BioSurge I System, 2.5 cc AlloSync Pure DBM w/ Arthrex Angel® cPRP and BMA tray	ABS-**2016-01**
BioSurge II System, 5.0 cc AlloSync Pure DBM w/ Arthrex Angel cPRP and BMA tray	ABS-**2016-02**
BioSurge IV System, 5.0 cc AlloSync DBM cortical fibers w/ Arthrex Powered Angel System	ABS-**2016-04**
BioSurge III System, 15 mm × 40 mm × 3 mm AlloSync DBM cancellous strip w/ Arthrex Angel cPRP and BMA tray	ABS-**2016-03**
BioSurge V System, 12 mm × 3 mm AlloSync button disc w/ Arthrex Angel cPRP and BMA tray	ABS-**2016-05**

OsteoAuger™ Bone Graft Harvesting System

Product Description	Item Number
OsteoAuger Bone Graft Harvesting System, 6 mm	ABS-**8000-06**
OsteoAuger Bone Graft Harvesting System, 8 mm	ABS-**8000-08**
OsteoAuger Bone Graft Harvesting System, 10 mm	ABS-**8000-10**

Bone Repair Accessories

BioXpress™ Graft Delivery Device

Product Description	Item Number
Blunt Tip Cannula, 10 cm	ABS-**10053-10**
Angled Tip Cannula, 10 cm	ABS-**10053-10-45**
Blunt Tip Cannula, 15 cm	ABS-**10053-15**
Angled Tip Cannula, 15 cm	ABS-**10053-15-45**

GraftNet™ Autologous Tissue Collector

Product Description	Item Number
GraftNet Autologous Tissue Collector	ABS-**1050**

Autologous Blood Products

Angel® cPRP System for BMA Processing

Product Description	Item Number
Angel System Centrifuge	ABS-**10060**
Angel System Centrifuge, refurbished	ABS-**10060R**
Angel Kit	ABS-**10063**
Angel PRP Kit	ABS-**10061T**
Arthrex Biologics Cart	ABS-**10100**

Arthrex ACP® Double-Syringe System

Product Description	Item Number
ACP Double Syringe w/ Cap	ABS-**10010S**
Series I ACP Blood Draw Kit	ABS-**10011**
Series II ACP Blood Draw Kit	ABS-**10012**

Thrombinator™ System for Use With the Angel® cPRP System

Product Description	Item Number
Thrombinator System for Use With the Angel cPRP System	ABS-**10080**
Angel System Centrifuge	ABS-**10060**
Accessories	
Dual Cannula Semiflexible Endoscopic, 32 cm	SA-**3650**
Dual Spray Tip	SA-**3660**
Endoscopic Applicator w/ Mixing Tip, 30 cm, 1:1 ratio	SA-**3662**
Blending Connector w/ Single Flexible Cannula	SA-**3673**
Blending Connector w/ Single Spray	SA-**3674**
Mixing Applicator Low Viscosity w/ Spray Tip	SA-**3675**
Blending Connector w/ Mixer	SA-**3678**

Viscous Delivery Systems

Product Description	Item Number
Viscous-Gel Applicator, high viscosity	ABS-**10050**
Viscous-Spray Applicator, low viscosity	ABS-**10051**
Viscous-Spray II Applicator, low viscosity	ABS-**10052**
Adipose Tissue Harvesting Kit	ABS-**10055**
Fenestrated Delivery Needle	ABS-**20000**
Tuohy Delivery Needle	ABS-**21000**
Cannula Bending Tool	AR-**6650**
Ratio Applicator Assembly, 11:1 ratio	SA-**1001**
Applicator w/ Dual Spray Tips, 11:1 ratio	SA-**1060**
Dual Cannula, 6 ga × 10 cm (4 in)	SA-**3600**
Dual Cannula, 20 ga × 5 cm (2 in)	SA-**3615**
Dual Cannula, 20 ga × 10 cm (4 in)	SA-**3618**
Dual Cannula, 20 ga × 18 cm (7 in)	SA-**3619**
Dual Cannula, 20 ga × 26 cm (10.25 in)	SA-**3620**
Dual Cannula Semiflexible Endoscopic, 32 cm	SA-**3650**
Dual Spray Tip	SA-**3660**
Endoscopic Applicator w/ Mixing Tip, 30 cm, 1:1 ratio	SA-**3662**
Blending Connector w/ Single Flexible Cannula	SA-**3673**
Blending Connector w/ Single Spray	SA-**3674**
Mixing Applicator, low viscosity, w/ spray tip	SA-**3675**
Applicator Procedure Kit, 11:1 ratio	SA-**4400**
Dual Spray Procedure Kit, 11:1 ratio	SA-**4460**
Gas Assisted Procedure Kit, 11:1 ratio	SA-**6111**
Applicator Assembly, 3 cc, 1:1 ratio	SA-**3303**

Soft-Tissue Repair

Arthrex Amnion™ Matrix

Product Description	Item Number
Arthrex Amnion Matrix – Thin	
2 cm × 2 cm	ABS-**4100-022**
2 cm × 3 cm	ABS-**4100-023**
4 cm × 4 cm	ABS-**4100-044**
4 cm × 6 cm	ABS-**4100-046**
7 cm × 7 cm	ABS-**4100-077**
Arthrex Amnion Matrix – Thick	
2 cm × 2 cm	ABS-**4200-022**
2 cm × 3 cm	ABS-**4200-023**
2 cm × 4 cm	ABS-**4200-034**
2 cm × 6 cm	ABS-**4200-036**
2 cm × 8 cm	ABS-**4200-038**
5.5 cm × 4 cm	ABS-**4200-054**

Soft-Tissue Repair (Cont.)

Biovance® Amniotic Membrane Allograft

Product Description	Item Number
Biovance Amniotic Membrane, 1 cm × 2 cm	**DHAM0012**
Biovance Amniotic Membrane, 2 cm × 2 cm	**DHAM0022**
Biovance Amniotic Membrane, 2 cm × 3 cm	**DHAM0023**
Biovance Amniotic Membrane, 2 cm × 4 cm	**DHAM0024**
Biovance Amniotic Membrane, 3 cm × 3.5 cm	**DHAM0035**
Biovance Amniotic Membrane, 4 cm × 4 cm	**DHAM0044**
Biovance Amniotic Membrane, 5 cm × 5 cm	**DHAM0055**
Biovance Amniotic Membrane, 6 cm × 6 cm	**DHAM0066**

CentaFlex™ Decellularized Human Placental Matrix

Product Description	Item Number
CentaFlex Placental Matrix, 3 cm × 8 cm	**HPM0038**
CentaFlex Placental Matrix, 3 cm × 6 cm	**HPM0036**
CentaFlex Placental Matrix 3 cm × 4 cm	**HPM0034**
CentaFlex Placental Matrix, 2 cm × 3 cm	**HPM0023**
CentaFlex Placental Matrix, 3 cm × 3 cm	**HPM0033**
CentaFlex Placental Matrix, 2 cm × 2 cm	**HPM0022**
CentaFlex Placental Matrix, 0.5 cm × 4 cm	**HPM0054**

Interfyl® Human Connective Tissue Matrix

Product Description	Item Number
Interfyl Tissue Matrix, 50 mg particulate	**HCTM050**
Interfyl Tissue Matrix, 100 mg particulate	**HCTM100**
Interfyl Tissue Matrix, 0.3 mL flowable	**HCTM030**
Interfyl Tissue Matrix, 0.6 mL flowable	**HCTM060**
Interfyl Tissue Matrix, 1 mL flowable	**HCTM010**
Interfyl Tissue Matrix, 1.5 mL flowable	**HCTM015**

Spine Scorpion™ Suture Passer

Product Description	Item Number
Spine Scorpion Suture Passer	AR-**13998C**
SureFire® Scorpion Needle	AR-**13991N**
Suture Cutter, 4.2 mm, open ended, left notch	AR-**11794L**
Suture Cutter, 4.2 mm × 220 mm, open ended, left notch	**AR-16794L**
Small Knot Pusher	AR-**1296**
Single-Hole Knot Pusher	AR-**1299**
Knot Pusher, closed end	AR-**1305**

Wound Care

JumpStart® Contact Layer Dressing

Dressing Size	Qty/Box	Item Number
1 in × 1 in, fenestrated	10	ABS-**4001**
1.5 in × 8 in	10	ABS-**4005**
1.5 in × 10 in	10	ABS-**4006**
2 in × 2 in	10	ABS-**4002**
2 in × 5 in	10	ABS-**4025**
3 in × 3 in	10	ABS-**4003**
4 in × 4 in	10	ABS-**4004**
8 in × 8 in	1	ABS-**4008**
12 in × 12 in	1	ABS-**4012**

JumpStart Composite Dressing

Adhesive Size (in)	Dressing Size (in)	Qty/Box	Item Number
2.5 Diameter	1.0 Diameter	10	ABS-**4054**
4.0 Diameter	1.0 Diameter	10	ABS-**4056**
4 × 4	2 × 2	5	ABS-**4053**
5 × 6	1.5 × 5	5	ABS-**4051**
4.5 × 10	1.5 × 7	5	ABS-**4052**
6 × 11.5	2 × 9	5	ABS-**4050**
4.4 × 9.6	1.5 × 6.5	5	ABS-**4057**
4.2 × 7.5	1.4 × 4.5	5	ABS-**4058**

Energel® Wound Hydrogel

Product Description	Item Number
Energel Wound Hydrogel	AGL-**L075-10**

JumpStart FlexEFit® Wound Dressings

Pad Dimensions	Adhesive Dimensions	Qty/Box	Item Number
1.5 in × 4.5 in	2.5 in × 6.3 in	5	ABS-**4060-05**
3.8 cm × 11.4 cm	6.3 cm × 16 cm	10	ABS-**4060-10**

References

1. Malinin TI, Carpenter EM, Temple HT. Particulate bone allograft incorporation in regeneration of osseous defects; importance of particle sizes. *Open Orthop J*. 2007;1:19-24. doi:10.2174/1874325000701010019
2. Gruskin E, Doll BA, Futrell FW, Schmitz JP, Hollinger JO. Demineralized bone matrix in bone repair: history and use. *Adv Drug Deliv Rev*. 2012;64(12):1063-1077. doi:10.1016/j.addr.2012.06.008
3. Risbud MV, Shapiro IM, Guttapalli A, et al. Osteogenic potential of adult human stem cells of the lumbar vertebral body and the iliac crest. *Spine*. 2006;31(1):83-89
4. D'Ippolito G, Schiller PC, Ricordi C, Roos BA, Howard GA. Age related osteogenic potential of mesenchymal stromal stem cell from human vertebral bone marrow. *J Bone Miner Res*.1999;14(7):1115-1122. doi:10.1359/jbmr.1999.14.7.1115
5. D'Ippolito G, Diabira S, Howard GA, Menei P, Roos BA, Schiller PC. Marrow-isolatedadult multilineage inducible (MIAMI) cells, a unique population of post-natal young and old human cells with extensive expansion and differentiation potential. *J Cell Sci*. 2004;117(14):2971-2981. doi:10.1242/jcs.01103
6. Grabowski G, Robertson RN. Bone allograft with mesenchymal stem cells: a critical review of the literature. *Hard Tissue*. 2013;2(2):22
7. Ryan J, Barry F, Murphy J, Mahon B. Mesenchymal stem cells avoid allogeneic rejection. *J Inflamm*. 2005;2:8. doi:10.1186/1476-9255-2-8
8. McLain RF, Fleming JE, Boehm CA, Muschler GF. Aspiration of osteoprogenitor cells for augmenting spinal fusion: comparison of progenitor cell concentrations from the vertebral body and iliac crest. *J Bone Joint Surg*. 2005;87-A(12):2655-2661. doi:10.2106/JBJS.E.00230
9. Vivex Biomedical, Inc. Data on file. Miami, FL
10. Martin GJ, Boden SD, Titus L, Scarborough NL. New formulations of demineralized bone matrix as a more effective graft alternative in experimental posterolateral lumbar spine arthrodesis. *Spine*. 1999;24(7):637-645. doi:10.1097/00007632-199904010-00005
11. CellRight Technologies, LLC. Data on file (ConCelltrate® 100 histology and in-vitro alkaline phosphate induction assay). Universal City, TX; 2017
12. Kay JF, Khaliq S, Neubauer P. Effective design of bone graft materials using osteoinductive and osteoconductive components. *American Association of Tissue Banks*. https://www.aatb.org/sites/default/files/ 2003Abstract13.pdf. Accessed January 23, 2018
13. Neubauer P, Kay JF, Khaliq SA, Fox WC. Histologic, radiographic, and biomechanical evaluation of a DBM/CaP composite bone graft in an unstabilized, critical size rabbit ulna defect. *American Association of Tissue Banks*. https://www.aatb.org/sites/default/files/2004Abstract17.pdf. Accessed January 23, 2018
14. CellRight Technologies, LLC. Data on file (ConCelltrate® 100 histology and in-vitro alkaline phosphate induction assay). Universal City, TX; 2017
15. Mataragas, N. Radiographic analysis of fusion success with integra collagen ceramic matrix, as compared to autograft use, in posterolateral lumbar spine arthrodesis. *Integra Life Sciences Corp*. Data on file. 2010
16. Geiger M, Li RH, Friess W. Collagen sponges for bone regeneration with rhBMP-2. *Adv Drug Deliv Rev*. 2003;55:1613-1629
17. SeaSpine. Test data on file. Carlsbad, CA
18. SeaSpine. Data on file. Carlsbad, CA
19. Ogose A, Hotta T, Kawashima H, et al. Comparison of hydroxyapatite and beta tricalcium phosphate as bone substitutes after excision of bone tumors. *J Biomed Mater Res*. 2005;72B(1):108. doi: 10.1002/jbm.b.30136
20. McLain RF, Boehm CA, Rufo-Smith C, Muschler GF. Transpedicular aspiration of osteoprogenitor cells from the vertebral body: progenitor cell concentrations affected by serial aspiration. *Spine J*. 2009;9(12):995-1002. doi:10.1016/j.spinee.2009.08.455
21. Arthrex, Inc. Data on file (APT 2470). Naples, FL; 2014
22. Scott A, Khan KM, Roberts CR, Cook JL, Duronio V. What do we mean by the term "inflammation"? A contemporary basic science update for sports medicine. *Br J Sports Med*. 2004;38(3):372-380. doi:10.1136/bjsm.2004.011312
23. Jiang N, Tan NS, Ho B, Ding JL. Respiratory protein–generated reactive oxygen species as an antimicrobial strategy. *Nat Immunol*. 2007;8(10):1114-1122. doi:10.1038/ni1501
24. Coolen NA, Schouten KC, Middelkoop E, Ulrich MM. Comparison between human fetal and adult skin. *Arch Dermatol Res*. 2010;302(1):47-55. doi:10.1007/s00403-009-0989-8
25. Coolen NA, Schouten KC, Boekema BK, Middelkoop E, Ulrich MM. Wound healing in a fetal, adult, and scar tissue model: a comparative study. *Wound Repair Regen*. 2010;18(3):291-301. doi:10.1111/j.1524-475X.2010.00585.x
26. Tseng SC, Espana EM, Kawakita T, et al. How does amniotic membrane work? *Ocul Surf*. 2004;2(3):177-187. doi:10.1016/s1542-0124(12)70059-9
27. Riordan NH, George BA, Chandler TB, McKenna RW. Case report of non-healing surgical wound treated with dehydrated human amniotic membrane. *J Transl Med*. 2015;13:242. doi:10.1186/s12967-015-0608-8
28. Kim SS, Sohn SK, Lee KY, et al. Use of human amniotic membrane wrap in reducing perineural adhesions in a rabbit model of ulnar nerve. *neurorrhaphy. J Hand Surg Eur*. 2010;35(3):214-219. doi:10.1177/1753193409352410
29. Delcroix GJ, Namin S, D'Ippolito G, Temple HT, Marshall R. Preserving the natural regenerative potential of amniotic membrane. Vivex Biomedical.
30. Niknejad H, Peirovi H, Jorjani M, et al. Properties of the amniotic membrane for potential use in tissue engineering. *Eur Cell Mater*. 2008;15:88-89
31. Kim H, Makin I, Skiba J, et al. Antibacterial efficacy testing of a bioelectric wound dressing against clinical wound pathogens. *Open Microbiol J*. 2014;8:15-21. doi:10.2174/1874285801408010015
32. Banerjee J, Ghatak P, Roy S, et al. Silver-zinc redox-coupled electroceutical wound dressing disrupts bacterial biofilm. *PLoS One*. 2015:1-15. doi:10.1371/journal.pone.0119531
33. Kim H, Izadjoo M. Antibioilm eÏcacy evaluation of a bioelectric dressing in mono- and multi-species biofilms. *J Wound Care*. 2015;24 Suppl 2:S10-S14. doi:10.12968/jowc.2015.24.Sup2.S10
34. Barki K, Das A, Dixith S, et al. Electric field based dressing disrupts mixed species bacterial biofilm infection and restores functional wound healing. *Ann Surg*. 2019;269(4):756-766. doi:10.1097/SLA.0000000000002504.41
35. Vomaris Innovations, Inc. Data on file (report #SLM090512CMC01F). Tempe, AZ
36. Blount A, Foster S, Rapp D, et al. The use of bioelectric dressings in skin graft harvest sites: a prospective case series. *J Burn Care Res*. 2012;33(3):354-357. doi:10.1097/BCR.0b013e31823356e4
37. Keely Boyle K, Rachala S, Nodzo SR. Centers for Disease Control and Prevention 2017 guidelines for prevention of surgical site infections: review and relevant recommendations. *Curr Rev Musculoskelet Med*. 2018;11(3):357-369. doi:10.1007/s12178-018-9498-8
38. WHO global guidelines for the prevention of surgical site infection. World Health Organization. Accessed July 12, 2021. https://www.who.int/gpsc/SSI-outline.pdf.
39. Klevens RM, Edwards JR, Richards CL Jr, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep*. 2007;122(2):160-166. doi:10.1177/003335490712200205
40. MA Preas, O'Hara L, Thom K. HICPAC-CDC guideline for prevention of surgical site infection: what the infection preventionist needs to know. Association for Professionals in Infection Control and Epidemiology. Accessed July 12, 2021. https://apic.org/Resource_/TinyMceFileManager/Periodical_images/API-Q0414_L_SSI_Guidelines_Final.pdf.
41. D Scott. The direct medical costs of healthcare-associated infection in U.S. hospitals and the benefits of prevention. Centers for Disease Control and Prevention. Accessed July 12, 2021. https://www.cdc.gov/hai/pdfs/hai/scott_costpaper.pdf.
42. Leaper DJ, van Goor H, Reilly J, et al. Surgical site infection - a European perspective of incidence and economic burden. *Int Wound J*. 2004;1(4):247-273. doi:10.1111/j.1742-4801.2004.00067.x
43. Surveillance of surgical site infections in Europe 2010-2011. European Centre for Disease Prevention and Control. Accessed July 12, 2021. https://www.ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/SSI-in-europe-2010-2011.pdf.
44. Global Guidelines for the Prevention of Surgical Site Infection. World Health Organization. Accessed July 12, 2021. https://www.who.int/publications/i/item/global-guidelines-for-the-prevention-of-surgical-site-infection-2nd-ed.
45. Cooke CL, Greene RS, van Eck CF, Uquilas C, Limpisvasti O. Bioelectric silver-zinc dressing equally effective to chlorhexidine in reducing skin bacterial load in healthy volunteers. *Arthroscopy*. 2018;34(10):2886-2891. doi:10.1016/j.arthro.2018.05.046
46. Long DR, Bryson-Cahn C, Pergamit R, et al. 2021 Young Investigator Award winner: anatomic gradients in the microbiology of spinal fusion surgical site infection and resistance to surgical antimicrobial prophylaxis. *Spine*. 2021;46(3):143-151. doi:10.1097/BRS.0000000000003603

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