

(701113)

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<b>Preauthorization</b>	Yes	<b>Review Dates:</b> 03/12, 03/13, 03/14, 03/15, 07/15, 07/16, 11/16, 03/17, 03/18, 03/19, 03/20	

**Preauthorization is required.**

*The following protocol contains medical necessity criteria that apply for this service. The criteria are also applicable to services provided in the local Medicare Advantage operating area for those members, unless separate Medicare Advantage criteria are indicated. If the criteria are not met, reimbursement will be denied and the patient cannot be billed. Please note that payment for covered services is subject to eligibility and the limitations noted in the patient's contract at the time the services are rendered.*

Populations	Interventions	Comparators	Outcomes
Individuals: <ul style="list-style-type: none"> <li>Who are undergoing breast reconstruction</li> </ul>	Interventions of interest are: <ul style="list-style-type: none"> <li>Allogeneic acellular dermal matrix products</li> </ul>	Comparators of interest are: <ul style="list-style-type: none"> <li>Breast reconstruction without an acellular dermal matrix product</li> </ul>	Relevant outcomes include: <ul style="list-style-type: none"> <li>Symptoms</li> <li>Morbid events</li> <li>Functional outcomes</li> <li>Quality of life</li> <li>Treatment-related morbidity</li> </ul>
Individuals: <ul style="list-style-type: none"> <li>Who are undergoing tendon repair</li> </ul>	Interventions of interest are: <ul style="list-style-type: none"> <li>Graftjacket</li> </ul>	Comparators of interest are: <ul style="list-style-type: none"> <li>Surgical repair alone</li> </ul>	Relevant outcomes include: <ul style="list-style-type: none"> <li>Symptoms</li> <li>Morbid events</li> <li>Functional outcomes</li> <li>Quality of life</li> <li>Treatment-related morbidity</li> </ul>
Individuals: <ul style="list-style-type: none"> <li>Who are undergoing surgical repair of hernias or parastomal reinforcement</li> </ul>	Interventions of interest are: <ul style="list-style-type: none"> <li>Acellular collagen-based scaffolds</li> </ul>	Comparators of interest are: <ul style="list-style-type: none"> <li>Surgical repair alone</li> <li>Standard surgical mesh</li> </ul>	Relevant outcomes include: <ul style="list-style-type: none"> <li>Symptoms</li> <li>Morbid events</li> <li>Functional outcomes</li> <li>Quality of life</li> <li>Treatment-related morbidity</li> </ul>
Individuals: <ul style="list-style-type: none"> <li>With diabetic lower-extremity ulcers</li> </ul>	Interventions of interest are: <ul style="list-style-type: none"> <li>Apligraf, Dermagraft, AlloPatch or Integra</li> </ul>	Comparators of interest are: <ul style="list-style-type: none"> <li>Standard wound care</li> </ul>	Relevant outcomes include: <ul style="list-style-type: none"> <li>Disease-specific survival</li> <li>Symptoms</li> <li>Change in disease status</li> <li>Morbid events</li> <li>Quality of life</li> </ul>
Individuals: <ul style="list-style-type: none"> <li>With diabetic lower-extremity ulcers</li> </ul>	Interventions of interest are: <ul style="list-style-type: none"> <li>Acellular dermal matrix products other than Apligraf, Dermagraft, AlloPatch or Integra</li> </ul>	Comparators of interest are: <ul style="list-style-type: none"> <li>Standard wound care</li> </ul>	Relevant outcomes include: <ul style="list-style-type: none"> <li>Disease-specific survival</li> <li>Symptoms</li> <li>Change in disease status</li> <li>Morbid events</li> <li>Quality of life</li> </ul>

Populations	Interventions	Comparators	Outcomes
Individuals: • With lower-extremity ulcers due to venous insufficiency	Interventions of interest are: • Apligraf and Oasis Wound Matrix	Comparators of interest are: • Standard wound care	Relevant outcomes include: • Disease-specific survival • Symptoms • Change in disease status • Morbid events • Quality of life
Individuals: • With lower-extremity ulcers due to venous insufficiency	Interventions of interest are: • Bioengineered skin substitutes other than Apligraf and Oasis Wound Matrix	Comparators of interest are: • Standard wound care	Relevant outcomes include: • Disease-specific survival • Symptoms • Change in disease status • Morbid events • Quality of life
Individuals: • With dystrophic epidermolysis bullosa	Interventions of interest are: • Bioengineered skin substitutes (i.e., OrCel)	Comparators of interest are: • Standard wound care	Relevant outcomes include: • Symptoms • Change in disease status • Morbid events • Quality of life
Individuals: • With deep dermal burns	Interventions of interest are: • Bioengineered skin substitutes (i.e., Epicel, Integra Dermal Regeneration Template)	Comparators of interest are: • Standard wound care	Relevant outcomes include: • Disease-specific survival • Symptoms • Morbid events • Functional outcomes • Quality of life • Treatment-related morbidity

## DESCRIPTION

Bioengineered skin and soft tissue substitutes may be derived from human tissue (autologous or allogeneic), nonhuman tissue (xenographic), synthetic materials, or a composite of these materials. Bioengineered skin and soft tissue substitutes are being evaluated for a variety of conditions, including breast reconstruction and healing lower-extremity ulcers and severe burns. Acellular dermal matrix (ADM) products are also being evaluated for soft tissue repair.

## SUMMARY OF EVIDENCE

### BREAST RECONSTRUCTION

For individuals who are undergoing breast reconstruction who receive allogeneic ADM products, the evidence includes randomized controlled trials (RCTs) and systematic reviews. Relevant outcomes are symptoms, morbid events, functional outcomes, quality of life, and treatment-related morbidity. A systematic review found no difference in overall complication rates with ADM allograft compared with standard procedures for breast reconstruction. Reconstructions with ADM have been reported to have higher seroma, infection, and necrosis rates than reconstructions without ADM. However, capsular contracture and malposition of implants may be reduced. Thus, in cases where there is limited tissue coverage, the available evidence may inform patient decision making about reconstruction options. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

#### TENDON REPAIR

For individuals who are undergoing tendon repair who receive Graftjacket, the evidence includes an RCT. Relevant outcomes are symptoms, morbid events, functional outcomes, quality of life, and treatment-related morbidity. The RCT identified improved outcomes with the Graftjacket ADM allograft for rotator cuff repair. Although these results were positive, additional study with a larger number of patients is needed to evaluate the consistency of the effect. The evidence is insufficient to determine the effects of the technology on health outcomes.

#### SURGICAL REPAIR OF HERNIAS OR PARASTOMAL REINFORCEMENT

For individuals who are undergoing surgical repair of hernias or parastomal reinforcement who receive acellular collagen-based scaffolds, the evidence includes RCTs. Relevant outcomes are symptoms, morbid events, functional outcomes, quality of life, and treatment-related morbidity. Several comparative studies including RCTs have shown no difference in outcomes between tissue-engineered skin substitutes and either standard synthetic mesh or no reinforcement. The evidence is sufficient to determine that the technology is unlikely to improve the net health outcome.

#### DIABETIC LOWER-EXTREMITY ULCERS

For individuals who have diabetic lower-extremity ulcers who receive AlloPatch, Apligraf, Dermagraft, or Integra, the evidence includes RCTs. Relevant outcomes are disease-specific survival, symptoms, change in disease status, morbid events, and quality of life. RCTs have demonstrated the efficacy of AlloPatch (reticular ADM), Apligraf and Dermagraft (living cell therapy), and Integra (biosynthetic) over the standard of care. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have diabetic lower-extremity ulcers who receive ADM products other than AlloPatch, Apligraf, Dermagraft, or Integra, the evidence includes RCTs. Relevant outcomes are disease-specific survival, symptoms, change in disease status, morbid events, and quality of life. Results from a multicenter RCT showed some benefit of DermACELL that was primarily for the subgroup of patients who only required a single application of the ADM. Studies are needed to further define the population who might benefit from this treatment. Additional study with a larger number of subjects is needed to evaluate the effect of Graftjacket, TheraSkin, DermACELL, Cytal, PriMatrix, and Oasis Wound Matrix, compared with current SOC or other advanced wound therapies. The evidence is insufficient to determine the effects of the technology on health outcomes.

#### LOWER-EXTREMITY ULCERS DUE TO VENOUS INSUFFICIENCY

For individuals who have lower-extremity ulcers due to venous insufficiency who receive Apligraf or Oasis Wound Matrix, the evidence includes RCTs. Relevant outcomes are disease-specific survival, symptoms, change in disease status, morbid events, and quality of life. RCTs have demonstrated the efficacy of Apligraf living cell therapy and xenogenic Oasis Wound Matrix over the standard of care. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have lower-extremity ulcers due to venous insufficiency who receive bioengineered skin substitutes other than Apligraf or Oasis Wound Matrix, the evidence includes RCTs. Relevant outcomes are disease-specific survival, symptoms, change in disease status, morbid events, and quality of life. In a moderately large RCT, Dermagraft was not shown to be more effective than controls for the primary or secondary end points in the entire population and was only slightly more effective than controls (an 8%-15% increase in healing) in subgroups of patients with ulcer durations of 12 months or less or size of 10 cm or less. Additional study with a larger number of subjects is needed to evaluate the effect of the xenogenic PriMatrix skin substitute vs. the current standard of care. The evidence is insufficient to determine the effects of the technology on health outcomes.

### DYSTROPHIC EPIDERMOLYSIS BULLOSA

For individuals who have dystrophic epidermolysis bullosa who receive OrCel, the evidence includes case series. Relevant outcomes are symptoms, change in disease status, morbid events, and quality of life. OrCel was approved under a humanitarian drug exemption for use in patients with dystrophic epidermolysis bullosa undergoing hand reconstruction surgery, to close and heal wounds created by the surgery, including those at donor sites. Outcomes have been reported in small series (e.g., five patients). The evidence is insufficient to determine the effects of the technology on health outcomes.

### DEEP DERMAL BURNS

For individuals who have deep dermal burns who receive bioengineered skin substitutes (i.e., Epicel, Integra Dermal Regeneration Template), the evidence includes RCTs. Relevant outcomes are disease-specific survival, symptoms, change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. Overall, few skin substitutes have been approved, and the evidence is limited for each product. Epicel (living cell therapy) has received Food and Drug Administration approval under a humanitarian device exemption for the treatment of deep dermal or full-thickness burns comprising a total body surface area of 30% or more. Comparative studies have demonstrated improved outcomes for biosynthetic skin substitute Integra Dermal Regeneration Template for the treatment of burns. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

### CLINICAL INPUT

Clinical input has been obtained on several occasions. The input considered ADM products to be medically necessary for breast reconstruction under select conditions and for the various products to be similar in efficacy. Input was mixed on the efficacy of xenogenic products for other indications.

It was concluded that, based on the extensive data from case series and clinical input on the usefulness of this procedure in providing inferolateral support for breast reconstruction, this procedure was medically necessary for breast reconstruction when there is insufficient tissue expander or implant coverage by the pectoralis major muscle and additional coverage is required; when there is viable but compromised or thin postmastectomy skin flaps that are at risk of dehiscence or necrosis; or when the inframammary fold and lateral mammary folds have been undermined during mastectomy and reestablishment of these landmarks is needed.

### POLICY

Breast reconstructive surgery using allogeneic acellular dermal matrix products<sup>a</sup> (including each of the following: AlloDerm<sup>®</sup>, AlloMend<sup>®</sup>, Cortiva<sup>®</sup> [AlloMax<sup>™</sup>], DermACELL<sup>™</sup>, DermaMatrix<sup>™</sup>, FlexHD<sup>®</sup>, FlexHD<sup>®</sup> Pliable<sup>™</sup> GraftJacket<sup>®</sup>; see Policy Guidelines) may be considered **medically necessary**:

- when there is insufficient tissue expander or implant coverage by the pectoralis major muscle and additional coverage is required,
- when there is viable but compromised or thin postmastectomy skin flaps that are at risk of dehiscence or necrosis, or
- the inframammary fold and lateral mammary folds have been undermined during mastectomy and reestablishment of these landmarks is needed.

Treatment of chronic, noninfected, full-thickness diabetic lower-extremity ulcers using the following tissue-engineered skin substitutes may be considered **medically necessary**:

- AlloPatch<sup>®a</sup>
- Apligraf<sup>®b</sup>

- Dermagraft<sup>®b</sup>
- Integra<sup>®</sup> Omnigraft<sup>™</sup> Dermal Regeneration Matrix (also known as Omnigraft<sup>™</sup>) and Integra Flowable Wound Matrix.

Treatment of chronic, noninfected, partial- or full-thickness lower extremity skin ulcers due to venous insufficiency, which have not adequately responded following a one-month period of conventional ulcer therapy, using the following tissue-engineered skin substitutes may be considered **medically necessary**:

- Apligraf<sup>®b</sup>
- Oasis<sup>™</sup> Wound Matrix<sup>c</sup>

Treatment of dystrophic epidermolysis bullosa using the following tissue-engineered skin substitutes may be considered **medically necessary**:

- OrCel<sup>™</sup> (for the treatment of mitten-hand deformity when standard wound therapy has failed and when provided in accordance with the humanitarian device exemption [HDE] specifications of the U.S. Food and Drug Administration [FDA])<sup>d</sup>.

Treatment of second- and third-degree burns using the following tissue-engineered skin substitutes may be considered **medically necessary**:

- Epicel<sup>®</sup> (for the treatment of deep dermal or full-thickness burns comprising a total body surface area of 30% or more when provided in accordance with the HDE specifications of the FDA)<sup>d</sup>
- Integra<sup>®</sup> Dermal Regeneration Template<sup>b</sup>

<sup>a</sup>Banked Human Tissue

<sup>b</sup>FDA premarket approval

<sup>c</sup>FDA 510(k) clearance

<sup>d</sup>FDA-approved under HDE

All other uses of the bio-engineered skin and soft tissue substitutes listed above are considered **investigational**.

All other skin and soft tissue substitutes not listed above are considered **investigational**, including, but not limited to:

- |   |  |  |
|---|--|--|
| • ACell <sup>®</sup> UBM Hydated/lyophilized Wound Dressing | • CollaWound <sup>™</sup>                                  | • E-Z Derm <sup>™</sup>                            |
| • AlloSkin <sup>™</sup>                                     | • Collexa <sup>®</sup>                                     | • GammaGraft                                       |
| • AlloSkin <sup>™</sup> RT                                  | • Collieva <sup>®</sup>                                    | • GraftJacket <sup>®</sup> Xpress, injectable      |
| • Aongen <sup>™</sup> Collagen Matrix                       | • Conexa <sup>™</sup>                                      | • Helicoll <sup>™</sup>                            |
| • Architect <sup>®</sup> ECM, PX, FX                        | • Coreleader Colla-Pad                                     | • Hyalomatrix <sup>®</sup>                         |
| • ArthroFlex <sup>™</sup> (FlexGraft)                       | • CorMatrix <sup>®</sup>                                   | • Hyalomatrix <sup>®</sup> PA                      |
| • Atlas Wound Matrix  | • Cymetra <sup>™</sup> (Micronized AlloDerm <sup>™</sup> ) | • hMatrix <sup>®</sup>                             |
| • Avagen Wound Dressing                                     | • Cytal <sup>™</sup> (previously MatriStem <sup>®</sup> )  | • Integra <sup>™</sup> Bilayer Wound Matrix        |
| • AxoGuard <sup>®</sup> Nerve Protector (AxoGen)            | • Dermadapt <sup>™</sup> Wound Dressing                    | • Keramatrix <sup>®</sup>                          |
| • Biobrane <sup>®</sup> /Biobrane-L                         | • Dermapure <sup>™</sup>                                   | • Kerecis <sup>™</sup>                             |
| • CollaCare <sup>®</sup>                                    | • DermaSpan <sup>™</sup>                                   | • MariGen/Kerecis <sup>™</sup> Omega3 <sup>™</sup> |
| • CollaCare <sup>®</sup> Dental                             | • DressSkin  | • MatriDerm <sup>®</sup>                           |
| • Collagen Wound Dressing (Oasis Research)                  | • Durepair Regeneration Matrix <sup>®</sup>                | • Matrix HD <sup>™</sup>                           |
| • CollaGUARD <sup>®</sup>                                   | • Endoform Dermal Template <sup>™</sup>                    | • Mediskin <sup>®</sup>                            |
| • CollaMend <sup>™</sup>                                    | • ENDURAGEN <sup>™</sup>                                   | • MemoDerm <sup>™</sup>                            |
|   | • Excellagen   | • Microderm <sup>®</sup> biologic wound matrix     |
|   | • ExpressGraft <sup>™</sup>                                | • NeoForm <sup>™</sup>                             |

- NuCel
- Oasis® Burn Matrix
- Oasis® Ultra
- Pelvicol®/PelviSoft®
- Permacol™
- PriMatrix™
- Primatrix™ Dermal Repair Scaffold
- PuraPly™ Wound Matrix (previously FortaDerm™)
- PuraPly™ AM (Antimicrobial Wound Matrix)
- Puros® Dermis
- RegenePro™
- Repliform®
- Repriza™
- StrataGraft®
- Strattice™ (xenograft)
- Suprathel®
- SurgiMend®
- Talymed®
- TenoGlide™
- TenSIX™ Acellular Dermal Matrix
- TissueMend
- TheraForm™ Standard/Sheet
- TheraSkin®
- TransCyte™
- TruSkin™
- Veritas® Collagen Matrix
- XCM Biologic® Tissue Matrix
- XenMatrix™ AB

## POLICY GUIDELINES

**Note:** Amniotic membrane and amniotic fluid products are reviewed in the Amniotic Membrane and Amniotic Fluid Protocol.

Clinical input has indicated that the various ADM products used in breast reconstruction have similar efficacy. The products listed are those that have been identified for use in breast reconstruction. Additional ADM products may become available for this indication.

## MEDICARE ADVANTAGE

### PORCINE (PIG) SKIN DRESSINGS

For Medicare Advantage porcine (pig) skin dressings may be **medically necessary** as an occlusive dressing for burns, donor sites of a homograft, and decubiti and other ulcers. The following are examples of products that are derived from porcine, and because FDA approval is integral to the uses they are deemed reasonable and necessary for, it should be considered:

- Oasis™ Wound Matrix
- Permacol™

## BACKGROUND

### SKIN AND SOFT TISSUE SUBSTITUTES

Bioengineered skin and soft tissue substitutes may be either acellular or cellular. Acellular products (e.g., dermis with cellular material removed) contain a matrix or scaffold composed of materials such as collagen, hyaluronic acid, and fibronectin. Acellular dermal matrix (ADM) products can differ in a number of ways, including as species source (human, bovine, porcine), tissue source (e.g., dermis, pericardium, intestinal mucosa), additives (e.g., antibiotics, surfactants), hydration (wet, freeze-dried), and required preparation (multiple rinses, rehydration).

Cellular products contain living cells such as fibroblasts and keratinocytes within a matrix. The cells contained within the matrix may be autologous, allogeneic, or derived from other species (e.g., bovine, porcine). Skin substitutes may also be composed of dermal cells, epidermal cells, or a combination of dermal and epidermal cells, and may provide growth factors to stimulate healing. Bioengineered skin substitutes can be used as either temporary or permanent wound coverings.

## Applications

There are a large number of potential applications for artificial skin and soft tissue products. One large category is nonhealing wounds, which potentially encompasses diabetic neuropathic ulcers, vascular insufficiency ulcers, and pressure ulcers. A substantial minority of such wounds do not heal adequately with standard wound care, leading to prolonged morbidity and increased risk of mortality. For example, nonhealing lower-extremity wounds represent an ongoing risk for infection, sepsis, limb amputation, and death. Bioengineered skin and soft tissue substitutes have the potential to improve rates of healing and reduce secondary complications.

Other situations in which bioengineered skin products might substitute for living skin grafts include certain post-surgical states (e.g., breast reconstruction) in which skin coverage is inadequate for the procedure performed, or for surgical wounds in patients with compromised ability to heal. Second- and third-degree burns are another indication in which artificial skin products may substitute for auto- or allografts. Certain primary dermatologic conditions that involve large areas of skin breakdown (e.g., bullous diseases) may also be conditions in which artificial skin products can be considered as substitutes for skin grafts. ADM products are also being evaluated in the repair of other soft tissues including rotator cuff repair, following oral and facial surgery, hernias, and other conditions.

## REGULATORY STATUS

A large number of artificial skin products are commercially available or in development. The following summary of commercially available skin substitutes describes those products that have substantial relevant evidence on efficacy.

### ADM Products

Allograft ADM products derived from donated human skin tissue are supplied by tissue banks compliant with standards of the American Association of Tissue Banks and U.S. Food and Drug Administration (FDA) guidelines. The processing removes the cellular components (i.e., epidermis, all viable dermal cells) that can lead to rejection and infection. ADM products from human skin tissue are regarded as minimally processed and not significantly changed in structure from the natural material; FDA classifies ADM products as banked human tissue and, therefore, not requiring FDA approval.

- AlloDerm® (LifeCell Corp.) is an ADM (allograft) tissue-replacement product created from native human skin and processed so that the basement membrane and cellular matrix remain intact. Originally, AlloDerm® required refrigeration and rehydration before use. It is currently available in a ready-to-use product stored at room temperature. An injectable micronized form of AlloDerm® (Cymetra) is available.
- Cortiva® (previously marketed as AlloMax™ Surgical Graft and before that NeoForm™) is an acellular non-cross-linked human dermis allograft.
- AlloPatch® (Musculoskeletal Transplant Foundation) is an acellular human dermis allograft derived from the reticular layer of the dermis and marketed for wound care. This product is also marketed as FlexHD® for postmastectomy breast reconstruction.
- FlexHD® and the newer formulation FlexHD® Pliable™ (Musculoskeletal Transplant Foundation) are acellular hydrated reticular dermis allograft derived from donated human skin.
- DermACELL™ (LifeNet Health) is an allogeneic ADM processed with proprietary technologies MATRACELL® and PRESERVON®.
- DermaMatrix™ (Synthes) is a freeze-dried ADM derived from donated human skin tissue. DermaMatrix Acellular Dermis is processed by the Musculoskeletal Transplant Foundation.

- DermaPure™ (Tissue Regenix Wound Care) is a single-layer decellularized human dermal allograft for the treatment of acute and chronic wounds.
- Graftjacket® Regenerative Tissue Matrix (also called Graftjacket Skin Substitute; KCI) is an acellular regenerative tissue matrix that has been processed from human skin supplied from U.S. tissue banks. The allograft is minimally processed to remove the epidermal and dermal cells while preserving dermal structure. Graft-jacket Xpress® is an injectable product.

FDA product codes: FTM, OXF.

#### XENOGENIC PRODUCTS

Cytal™ (previously called MatriStem®) Wound Matrix, Multilayer Wound Matrix, Pelvic Floor Matrix, Micro-Matrix, and Burn Matrix (all manufactured by ACell) are composed of porcine-derived urinary bladder matrix.

Helicoll (Encol) is an acellular collagen matrix derived from bovine dermis. In 2004, it was cleared for marketing by FDA through the 510(k) process for topical wound management that includes partial and full-thickness wounds, pressure ulcers, venous ulcers, chronic vascular ulcers, diabetic ulcers, trauma wounds (e.g., abrasions, lacerations, second-degree burns, skin tears), and surgical wounds including donor sites/grafts.

Keramatrix® (Keraplast Research) is an open-cell foam comprised of freeze-dried keratin that is derived from acellular animal protein. In 2009, it was cleared for marketing by FDA through the 510(k) process under the name of Keratec. The wound dressings are indicated in the management of the following types of dry, light, and moderately exuding partial and full-thickness wounds: pressure (stage I-IV) and venous stasis ulcers, ulcers caused by mixed vascular etiologies, diabetic ulcers, donor sites, and grafts.

Kerecis™ Omega3 Wound (Kerecis) is an ADM derived from fish skin. It has a high content of omega 3 fatty acids and is intended for use in burn wounds, chronic wounds, and other applications.

Permacol™ (Covidien) is xenogeneic and composed of cross-linked porcine dermal collagen. Cross-linking improves the tensile strength and long-term durability but decreases pliability.

PriMatrix™ (TEI Biosciences) is a xenogeneic ADM processed from fetal bovine dermis. It was cleared for marketing by FDA through the 510(k) process for partial- and full-thickness wounds; diabetic, pressure, and venous stasis ulcers; surgical wounds; and tunneling, draining, and traumatic wounds. FDA product code: KGN.

SurgiMend® PRS (TEI Biosciences) is a xenogeneic ADM processed from fetal bovine dermis.

Strattice™ Reconstructive Tissue Matrix (LifeCell Corp.) is a xenogenic non-cross-linked porcine-derived ADM. There are pliable and firm versions, which are stored at room temperature and come fully hydrated.

Oasis™ Wound Matrix (Cook Biotech) is a collagen scaffold (extracellular matrix) derived from porcine small intestinal submucosa. In 2000, it was cleared for marketing by FDA through the 510(k) process for the management of partial- and full-thickness wounds, including pressure ulcers, venous ulcers, diabetic ulcers, chronic vascular ulcers, tunneled undermined wounds, surgical wounds, trauma wounds, and draining wounds. FDA Product code: KGN.

#### LIVING CELL THERAPY

Apligraf® (Organogenesis) is a bilayered living cell therapy composed of an epidermal layer of living human keratinocytes and a dermal layer of living human fibroblasts. Apligraf® is supplied as needed, in one size, with a shelf-life of 10 days. In 1998, it was approved by FDA for use in conjunction with compression therapy for the treatment of noninfected, partial- and full-thickness skin ulcers due to venous insufficiency and in 2001 for full-thickness neuropathic diabetic lower-extremity ulcers nonresponsive to standard wound therapy. FDA product code: FTM.

Dermagraft® (Organogenesis) is composed of cryopreserved human-derived fibroblasts and collagen derived

from newborn human foreskin and cultured on a bioabsorbable polyglactin mesh scaffold. Dermagraft has been approved by FDA for repair of diabetic foot ulcers. FDA product code: PFC.

TheraSkin® (Soluble Systems) is a cryopreserved split-thickness human skin allograft composed of living fibroblasts and keratinocytes and an extracellular matrix in epidermal and dermal layers. TheraSkin® is derived from human skin allograft supplied by tissue banks compliant with the American Association of Tissue Banks and FDA guidelines. It is considered a minimally processed human cell, tissue, and cellular- and tissue based product by FDA.

Epicel® (Genzyme Biosurgery) is an epithelial autograft composed of a patient's own keratinocytes cultured *ex vivo* and is FDA-approved under a humanitarian device exemption for the treatment of deep dermal or full-thickness burns comprising a total body surface area of 30% or more. It may be used in conjunction with split-thickness autografts or alone in patients for whom split-thickness autografts may not be an option due to the severity and extent of their burns. FDA product code: OCE.

OrCel™ (Forticell Bioscience; formerly Composite Cultured Skin) is an absorbable allogeneic bilayered cellular matrix, made of bovine collagen, in which human dermal cells have been cultured. It was approved by FDA pre-market approval for healing donor site wounds in burn victims and under a humanitarian device exemption (HDE) for use in patients with recessive dystrophic epidermolysis bullosa undergoing hand reconstruction surgery to close and heal wounds created by the surgery, including those at donor sites. FDA product code: ODS.

#### BIOSYNTHETIC PRODUCTS

Biobrane®/Biobrane-L (Smith & Nephew) is a biosynthetic wound dressing constructed of a silicon film with a nylon fabric partially imbedded into the film. The fabric creates a complex 3-dimensional structure of trifilament thread, which chemically binds collagen. Blood/sera clot in the nylon matrix, adhering the dressing to the wound until epithelialization occurs. FDA product code: FRO.

Integra® Dermal Regeneration Template (also marketed as Omnigraft Dermal Regeneration Matrix; Integra LifeSciences) is a bovine, collagen/glycosaminoglycan dermal replacement covered by a silicone temporary epidermal substitute. It was approved by FDA for use in the postexcisional treatment of life-threatening full-thickness or deep partial-thickness thermal injury where sufficient autograft is not available at the time of excision or not desirable because of the physiologic condition of the patient and for certain diabetic foot ulcers. Integra® Matrix Wound Dressing and Integra® Meshed Bilayer Wound Matrix are substantially equivalent skin substitutes and were cleared for marketing by FDA through the 510(k) process for other indications. Integra® Bilayer Matrix Wound Dressing (Integra LifeSciences) is designed to be used in conjunction with negative pressure wound therapy. The meshed bilayer provides a flexible wound covering and allows drainage of wound exudate. FDA product code: MDD.

TransCyte™ (Advanced Tissue Sciences) consists of human dermal fibroblasts grown on nylon mesh, combined with a synthetic epidermal layer and was approved by FDA in 1997. TransCyte is intended as a temporary covering over burns until autografting is possible. It can also be used as a temporary covering for some burn wounds that heal without autografting.

#### SYNTHETIC PRODUCTS

Suprathel® (PolyMedics Innovations) is a synthetic copolymer membrane fabricated from a tripolymer of polylactide, trimethylene carbonate, and *s*-caprolactone. It is used to provide temporary coverage of superficial dermal burns and wounds. Suprathel® is covered with gauze and a dressing that is left in place until the wound has healed.

## RELATED PROTOCOLS

Amniotic Membrane and Amniotic Fluid

Autologous Platelet-Derived Growth Factors as a Treatment for Wound Healing and Other Non-Orthopedic Conditions

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Services that are the subject of a clinical trial do not meet our Technology Assessment and Medically Necessary Services Protocol criteria and are considered investigational. *For explanation of experimental and investigational, please refer to the Technology Assessment and Medically Necessary Services Protocol.*

It is expected that only appropriate and medically necessary services will be rendered. We reserve the right to conduct prepayment and postpayment reviews to assess the medical appropriateness of the above-referenced procedures. **Some of this protocol may not pertain to the patients you provide care to, as it may relate to products that are not available in your geographic area.**

## REFERENCES

We are not responsible for the continuing viability of web site addresses that may be listed in any references below.

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