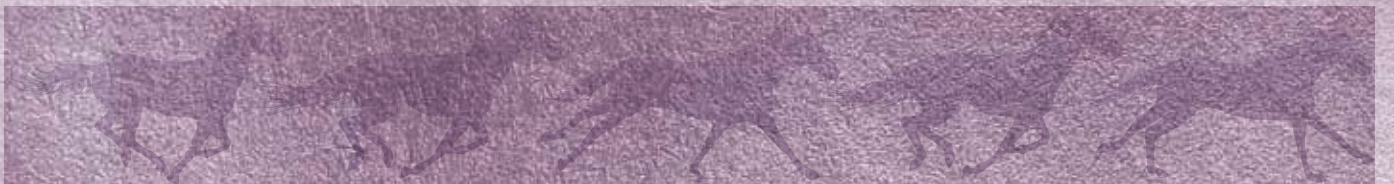


Aptus<sup>®</sup> EQUINE

PRESENTS

Sentrx<sup>™</sup>





**Aptus<sup>®</sup> EQUINE**

PRESENTS

**SentrX<sup>™</sup>**

– 21st century biomaterials  
to support natural wound healing in animals



## Aptus® SentrX Core Technology

When tissue is healthy, the extracellular matrix (ECM) provides support for cells and regulates intercellular communication. When an injury occurs, signals are released from the tissue that stimulate cells to repair the injury. Unfortunately, the process often leads to the formation of scar tissue rather than the appropriate new tissue.

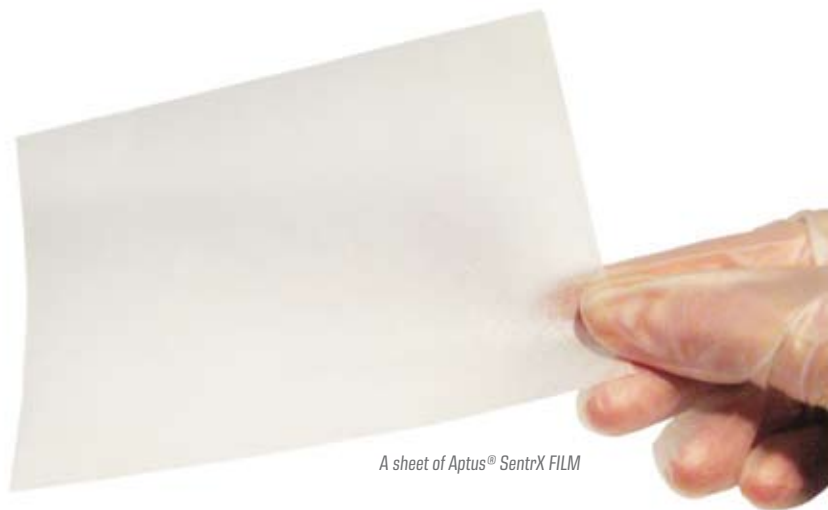
Aptus® SentrX products provide matrices that work with the animal's natural repair system to encourage enhanced production of the appropriate ECM, leading to new healthy tissue.

Aptus® SentrX existing and coming products are based on chemically-modified glycosaminoglycans (GAGs), in the extracellular matrix (ECM), to fabricate films and hydrogels.

These formulations are fully biocompatible, biodegradable at controlled rates, and non immunogenic. Aptus® SentrX cross-linking technology permits in situ cross-linking of hydrogels that can be easily and quickly applied. These biomaterials have been described in a large number of scientific publications (see page 26).

*An example of the synthesis of one proprietary version of the Company's biomaterial is shown below:*

Hyaluronic acid (HA), is chemically modified to add sulfhydryl groups, producing Hyascent-S (also referred to as CMHA-S). CMHA-S is then crosslinked using poly(ethylene glycol) diacrylate (PEGDA) to form a hydrogel. This hydrogel is then dried to form the Aptus® SentrX films.



A sheet of Aptus® SentrX FILM

## Products available on the market with Aptus® SentrX technology are following:

### For wound healing management

Aptus® SentrX SPRAY, 60 ml

Aptus® SentrX F.O.G (film on gauze), 10 x 7,5 cm (5 pieces)

### For use in the prevention of post-surgical adhesions

Aptus® SentrX FILM (adhesion prevention film), 15 X 20 cm (6 pieces)

### For dry eyes

Aptus® SentrX EYE GEL Drops, 15 ml bottle

*Can also be used for traumatic noninfected lesions.*



## **The composition of Aptus® SentrX existing and coming products**

Although there are differences in formulations among the various products, in general they all consist of significantly chemically modified glycosaminoglycans. These are generally very large molecules that are chemically linked to one another to create a scaffold matrix.

The “molecular scaffold” creates an ideal environment for cells to grow and differentiate into the appropriate tissue. The specific chemical formulation of each product is proprietary and is covered by US and international patents.



# Wound Healing Management



## Aptus® SentrX SPRAY, 60 ml

Wound healing spray provides wound management for chronic and/or traumatic wounds to the skin of horses. It is effective in promoting rapid wound closure by providing a matrix for cellular events that are required for normal healing to occur.



### Frequency of application

This depends on a number of different factors. In young, healthy animals with a fresh, uncomplicated wound, a single application may be sufficient to accelerate wound closure. For older animals or ones that are in poor health, or wounds that have been chronically unresponsive to various therapies, multiple applications for weeks or months may be necessary. Slow responders may need repeated debridement as well.

Aptus® SentrX SPRAY is a sterile product and durable 2 years from day of manufacture. Store in room temperature.

For examples, see [www.sentrxanimalcare.com](http://www.sentrxanimalcare.com).

*Aptus® SentrX products are a vital part of the first aid kit and must be on-hand when you need them. Keep an inventory readily available in your practice.*

## Aptus® SentrX F.O.G (film on gauze), 10 x 7,5 cm (5 pieces)

Film on gauze provides wound management for chronic and/or traumatic wounds to the skin of horses. It is effective in promoting rapid wound closure by providing a matrix for cellular events that are required for normal healing to occur. Aptus® SentrX F.O.G provides a bandage like-structure where the film rapidly hydrates to a hydrogel to accelerate tissue repair.



### Frequency of application

This depends on a number of different factors. In young, healthy animals with a fresh, uncomplicated wound, a single application may be sufficient to accelerate wound closure. For older animals or ones that are in poor health, or wounds that have been chronically unresponsive to various therapies, multiple applications for weeks or months may be necessary. Slow responders may need repeated debridement as well.

Aptus® SentrX F.O.G is a sterile product and durable 2 years from day of manufacture. Store in room temperature.

For examples, see [www.sentrxanimalcare.com](http://www.sentrxanimalcare.com).

*Aptus® SentrX products are a vital part of the first aid kit and must be on-hand when you need them. Keep an inventory readily available in your practice.*



Prevention of  
post-surgical adhesions



## Aptus® SentrX FILM (adhesion prevention film), 15 X 20 cm (6 pieces)

This medical device provides a biodegradable, biocompatible temporary barrier between tissues which are likely to inappropriately heal together causing adhesions, while simultaneously providing post-operative tissue management. Aptus® SentrX FILM provide a physical adhesion barrier and accelerate the natural healing process of injured tissues.

Aptus® SentrX FILM can be used for tendon adhesion prevention at the time of first surgery, abdominal or neural adhesion prevention or in any subsequent surgeries that could be required to repair adhesions from earlier surgery(s). *See case study on page 22*

Aptus® SentrX FILM is a sterile product and durable 2 years from day of manufacture. Store in room temperature.

For examples, see [www.sentrxanimalcare.com](http://www.sentrxanimalcare.com).

*Aptus® SentrX products are a vital part of the first aid kit and must be on-hand when you need them. Keep an inventory readily available in your practice.*



Dry eyes



## Aptus® SentrX EYE GEL Drops, 15 ml bottle

Aptus® SentrX crosslinked glycosaminoglycans act as a scaffold to facilitate cell migration.

Aptus® SentrX EYE GEL is intended for moisturizing and lubricating dogs', cats' and horse's eyes. It is useful for dry eyes and for when there is a noninfected trauma involved. Aptus® SentrX EYE GEL relieves the discomfort animals can experience when having an injured eye.



### Frequency of application

Aptus® SentrX EYE GEL works by directly drop the substance into the eye. The eyelids natural movement will distribute the eye gel evenly over the eye's surface. Aptus® SentrX EYE GEL can be used until normal function of the eyes are restored. Only use Aptus® SentrX EYE GEL under the supervision of a veterinarian.

Aptus® SentrX EYE GEL is a sterile product and durable 2 years from day of manufacture. Store in room temperature.

For examples, see [www.sentrxanimalcare.com](http://www.sentrxanimalcare.com).

*Aptus® SentrX products are a vital part of the first aid kit and must be on-hand when you need them. Keep an inventory readily available in your practice.*

FAQ



## How do the products accelerate wound healing?

When tissue is healthy, its extracellular matrix (ECM) provides support for cells and regulates communication between these cells. When an injury occurs, signals are released from the tissue that stimulates cells to repair the injury. Unfortunately, the process often leads to the formation of scar tissue rather than the appropriate new ECM. Aptus® SentrX products provide matrices that work with the animal's natural repair system to encourage enhanced production of the appropriate ECM, leading to new healthy tissue.

## How and when should the products be used?

These films and gels are designed to be used on fresh or debrided wounds. Because the products need access to the appropriate cells for healing, they do not work when applied to a mature, scabbed wound. The products should be applied directly to the wound surface, which can be dressed in the normal way, as per the veterinarian's practice.

## How do I use the Aptus® SentrX F.O.G product properly?

The Aptus® SentrX F.O.G is manufactured on a gauze backing to permit easy in handling. While the gauze simplifies handling, some users have had difficulty determining which side of the sheet is a film and which is gauze. It is important that the film side is applied directly to the wound. The gauze side is stamped as such for easy recognition, but in the absence of this label, the film side is smoother and shinier.

## What is the difference between Aptus® SentrX SPRAY and Aptus® SentrX F.O.G?

There is no difference in performance. The healing power has been compared in mice, rats and horses and both gave comparable acceleration of wound healing. The spray was developed specifically to treat large irregular shaped wounds and for ease in application to wounds that cannot be bandaged.

## How long does the material remain on a wound from time to time of treatment?

The answer depends on the formulation. These materials can be engineered to biodegrade at various rates. In case of Aptus® SentrX F.O.G, it is a few days. The spray remains on the wound for a shorter period of time.

## How often should a wound be retreated?

If a wound is dressed, then we recommend that a re-treatment should be done at each re-dressing. If the wound cannot be dressed, then treatment should be done daily until the wound is healed. Slow responders may need repeated debridement as well.

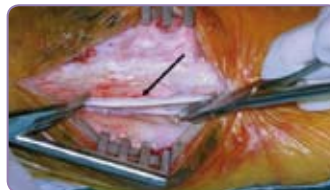
## How should Aptus® SentrX FILM be used?

These products are similar in composition to Aptus® SentrX F.O.G, but are not manufactured on gauze. That is because they are intended for internal use of post-surgical abdominal adhesions,

neural adhesions and tendon/ligament adhesions. Films are placed between potentially sticky tissues to prevent adhesions, which would likely require a second surgery. Many surgeons are familiar with how to use films for these purposes. Sterile film may be pre-hydrated with sterile water/saline or with body fluid at the surgical site before placing them among or around potentially adhesion tissues such as tendons, neural tissues and/or internal abdominal anatomy. Upon hydration, the film may tend to curl because it is initially hydrating on one side. Flipping the film over, or first dragging it through the fluid and then flipping the film will result in flat film that can be easily handled and place in the desired location.



*Flipping Aptus SentrX FILM before placing, for easy handling.*



*Placing Aptus SentrX FILM in the wound.*



# Case studies

*Note: The original company SENTRX SURGICAL, INC. has today been divided in to Sentrx Animal Care, Inc., Carbylan Biosurgery, Inc. and Glycosan Biosystems, Inc. Therefore other product names than Aptus® Sentrx are used in these case studies.*



## Case study: Dr Cinda Velasquez, Ernie, Equine May 2008, equitrX wound healing gel

Ernie suffered a serious injury. The wound was through the face into the oral cavity and was 5-6 inches long. He was seen by Dr. Cinda Velasquez. Ernie's wound was initially closed with a suture. The repair was not healing and abscessed 4 days later. The wound was taken apart, thoroughly debrided and repaired again. The wound did not become infected, but was not granulating in and was starting to pull apart. Dr Velasquez requested equitrX be sent overnight. Within 4 days of using the product, the wound had almost completely granulated in.



Original wound



Initial surgical closure



Wound abscessed post repair.  
Day 1 of equitrX use.



Day 2 of equitrX use



Day 4 of equitrX use

*"I started treatment with equitrX and the wound was almost completely granulated in within 4 days. It has now been about a month and there is minimal scarring which can only be seen if looked at closely."*

*Dr Cinda Velasquez*

*Note: equitrX wound healing gel is in our region marketed under the brand name Aptus® SentrX SPRAY.*

## Case study: Healing a dorsal metacarpal wound

(Figure A) Wound 13 days following primary closure by local veterinarian (partially dehisced). Sutures were removed, the wound debrided, exuberant granulation tissue along the proximal margin was trimmed. (Figure B) The same wound 7 days following debridement. The exuberant granulation tissue was trimmed at this time and two further times over the following 8 week period. At that time, the wound had become quiescent. (Figure C) Wound 2 days following final trimming of granulation tissue and immediately prior to first application of EquitrX film. (Figure D) Five days after initial application of EquitrX film. (Figure E) Three weeks after the initiation of treatment showing a re-stimulation of the healing process.



Figure A



Figure B



Figure C

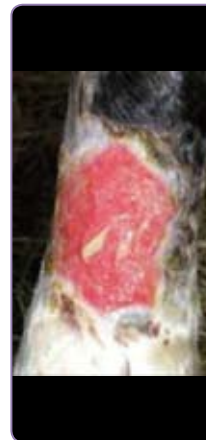


Figure D



Figure E

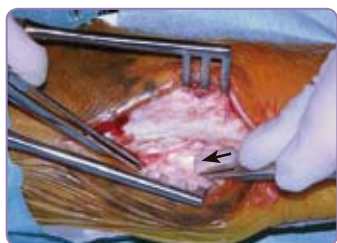
*Note: equitrX film is in our region marketed under the brand name Aptus® SentrX F.O.G.*

## Case study: Prevention of post-surgical adhesions in animals

In April 2006, Dr. Alan Nixon, a well-known equine orthopedic surgeon at Cornell University and Dr. Ben Schachter at Wellington Equine, Wellington, FL, operated on Balloo to repair a fractured splint bone. While this bone repair was successful, Balloo developed a tendon adhesion that prevented normal locomotion. In September, a second surgery was performed to surgically free the tendon adhesion and SentrX® equitrX biodegradable anti-adhesion film was inserted to prevent reformation of the original adhesion. One month later, Balloo was walking normally, ultrasound showed the adhesion to be absent and Balloo successfully competed in the winter of 2006-07.



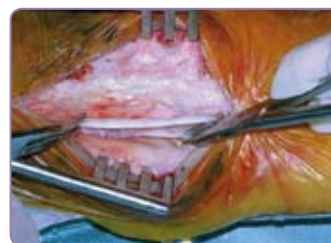
April 2006  
Plated MT4 4 months PostOP



Adhesion from DDFT to splint



Severed adhesion



Placing HA sheet

*Note: SentrX anti-adhesion film is in our region marketed under the brand name Aptus® SentrX FILM.*

Aptus® SentrX Store



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[www.orionvet.pl](http://www.orionvet.pl)

# Publications



## Publications regarding Aptus® SentrX wound healing technology

### Wound healing

K.R Kirker, Y Luo, J.H. Nielson, J. Shelby, and G.D. Prestwich, "Glycosaminoglycan Hydrogel Films as Biointeractive Dressings for Wound Healing." *Biomaterials*, 23, 3661-3671 (2002).

Y. Liu, X.Z. Shu, and G.D. Prestwich, "Reduced Postoperative Intra-abdominal Adhesions Using Carbylan-SX, a Semi-synthetic Glycosaminoglycan Hydrogel," *Fertil. & Steril.*, 87, 940-948 (2007).

Y. Liu, A. Skardal, X.Z. Shu, and G.D. Prestwich, "Prevention of Peritendinous Adhesions Following Flexor Tendon Injury with Carbylan-SX, a Semisynthetic Glycosaminoglycan Hydrogel," *J Orthop Res.* 2008 Apr;26(4):562-9.

Mann BK, Scott JA, Rees R, Brown J, Seppi M, Burns G, Prestwich GD. "Enhanced wound Healing in Horses and dogs using crosslinked hyaluronic acid-based films" Poster presented at the Society for Biomaterials Annual Meeting, Chicago, IL, April 2007.

G. Yang, L. Espandar, N. Mamalis and G.D. Prestwich, "A cross-linked hyaluronan gel accelerates healing of corneal epithelial abrasion and alkali burn injuries in rabbits". *Veterinary Ophthalmology* 13, (3), 144 – 150 (2010).

### Tissue Engineering

X.Z. Shu, Y. Liu, Y. Luo, M.C. Roberts, G.D. Prestwich, "Disulfide Cross-Linked Hyaluronan Hydrogels". *Biomacromolecules* 2002, 3, 1304-1311.

X.Z. Shu, Y. Liu, F. Palumbo, Y. Luo, and G.D. Prestwich, "In situ Crosslinkable Hyaluronan Hydrogels for Tissue Engineering," *Biomaterials*, 25, 1339-1348 (2004).

### General

Y. Liu, X.Z. Shu, and G.D. Prestwich, "Biocompatibility and Stability of Disulfide-Crosslinked Hyaluronan Films," *Biomaterials*, 26, 4737-4746 (2005).

K. Ghosh, X.Z. Shu, R. Mou R, J. Lombardi, G.D. Prestwich, M.H. Rafailovich, R.A.F. Clark. "Rheological Characterization of in Situ Cross-Linkable Hyaluronan Hydrogels". *Biomacromolecules*. 2005 Sep-Oct;6(5):2857-65.

G.D. Prestwich and J.W. Kuo, "Chemically-Modified HA for Therapy and Regenerative Medicine," invited article, *Curr. Pharm. Biotech.*, 2008 Aug;9(4):242-5. Review.



# Aptus<sup>®</sup> EQUINE

