

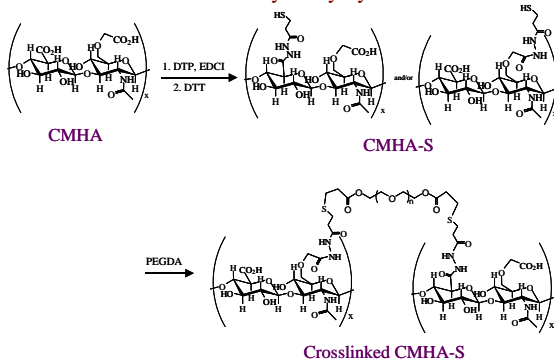
**Motivation**

Full-thickness wounds on large animals do not heal well

- Granulation tissue on horses leads to "proud flesh"
- Long healing times, severe scarring on dogs

Crosslinked CMHA-S materials have shown promise in small animals for accelerating wound healing, preventing post-surgical adhesion formation, and tissue engineering applications

**Thiolated Carboxymethylhyaluronic acid**



**Methods**

- CMHA-S + PEGda → hydrogel formation → dried at 40 °C to form film
- Non-stick gauze pad placed on top prior to drying for dog study
- 20x30mm (horses) or 20mm diameter (dogs) full-thickness wounds on front lower legs
- One leg treated with CMHA-S film, contralateral leg with chlorhexadene
- Wounds wrapped with gauze, cotton sheeting, & Vetrap
- Wounds retreated at 8 & 17 days; photographed at 0, 8, 17, 26 days for horses
- Wounds retreated at 7 & 14 days; photographed at 0, 7, 14, 21 days for dogs



Figure 1. Treated (left) and control (right) wounds of a horse at 26 days.

Figure 2. Treated (left) and control (right) wounds of a dog at 21 days.

**Results on Horses**

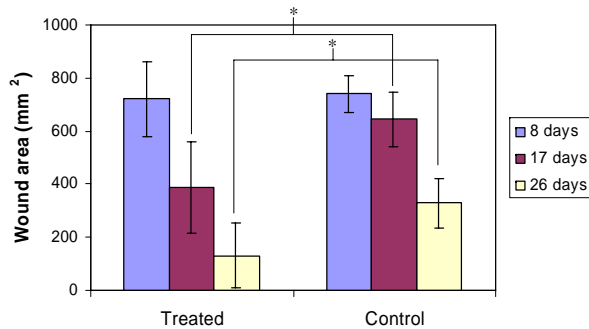


Figure 3. Area of treated and control wounds on lower front legs of horses.  
 \*Treated wounds significantly smaller than control wounds ( $p < 0.005$ )

**Results on Dogs**

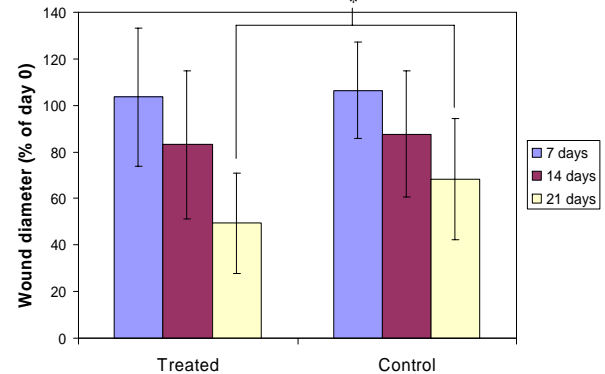


Figure 4. Diameter of treated and control wounds (as a percentage of original) on lower front legs of dogs.  
 \*Treated wounds significantly smaller than control wounds ( $p < 0.05$ )

**"Brubeck" – A Case Study**

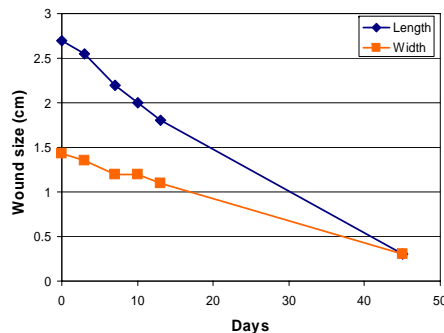


Figure 5. Length (along center) and width (at widest point) of Brubeck's wound treated with crosslinked CMHA-S film every 3-4 days for 19 days.

**Summary & Future Work**

- Modified hyaluronic acid-based films accelerated reepithelialization of full-thickness wounds on the legs of both horses and dogs
  - Future studies on dogs should be carried out for at least 4 weeks
  - Maintaining proper wound coverage on dogs is difficult and should be taken into account when determining treatment regimens and product formulation
- No scarring or granulation tissue was observed on treated wounds compared to control wounds
- Other product formulations are under development for different sized wounds
  - Gel formulation that can be rubbed onto small wounds of dogs & cats
  - Powder formulation that can be sprayed onto very large wounds of horses
- These materials offer a flexible platform that can be used in a variety of wound healing and tissue engineering applications
  - Materials can be formulated as hydrogels, films, sponges, and powders
  - Crosslinking degree and time are tailorable, and can be done *ex vivo* or *in situ*
  - Antibiotics, growth factors, or other drugs can be incorporated and released<sup>1,2</sup>
  - Other proteins and cells can be incorporated<sup>3,4</sup>

**References**

1. Riley CM, et al. *Biomaterials* 2006; 27: 5935-43
2. Liu Y, et al. *Fert Steril* 2005; 83: 1275-83
3. Shu XZ, et al. *Biomaterials* 2004; 25: 1339-48
4. Liu Y, et al. *J Orthoped Res* 2006; 24: 1454-62