



A Microcidal Drain Tube Attachment

Kelsey Hoegh, Tanner Marshall, Laura Platner,
Taylor Powers, Daniel Tighe

Client: Dr. Samuel Poore, Plastic and Reconstructive Surgery,
UW School of Medicine and Public Health

Advisor: Professor Mitch Tyler, Department of Biomedical Engineering, UW Madison

INTRODUCTION

- 300,000 patients diagnosed with breast cancer/year^[1]
- After mastectomy, surgical drain is left in place
- Surgical drain tubes used to drain fluid from wound



Figure 1. Diagram of a surgical drain tube.

<http://www.cancer.sutterhealth.org/information/bc_notebook/postoperative_care.html>

INTRODUCTION

- Remains in place for up to 14 days
- Patients clean and record fluid amount drained

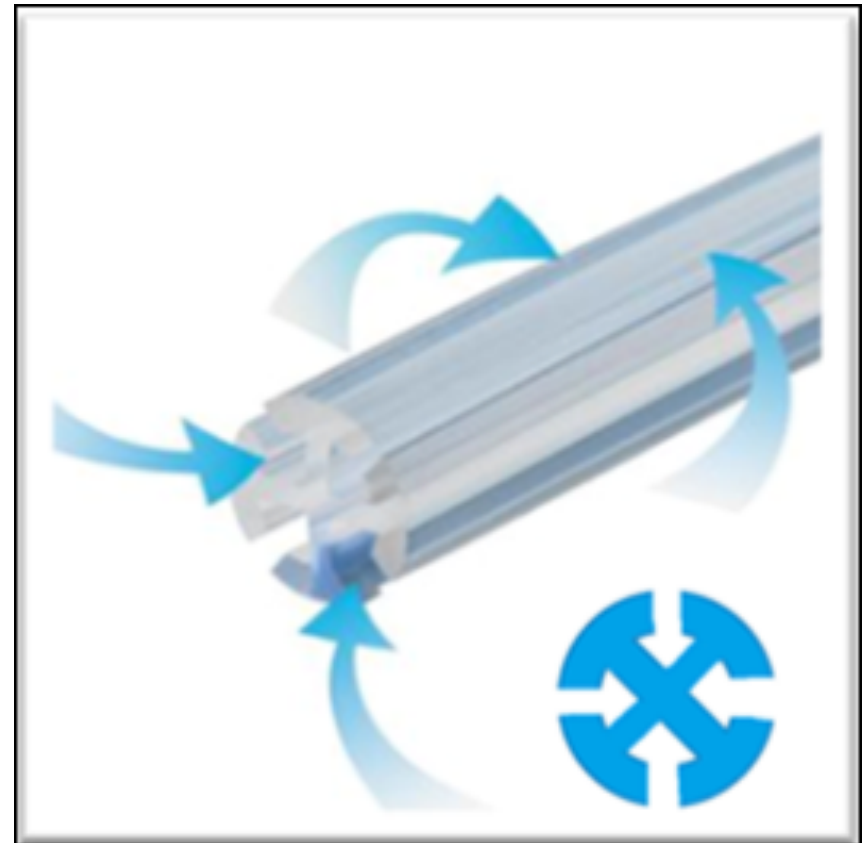


Figure 2. Close up view of a fluted drain tube with exploded cross-section.
<<http://www.ctsnet.org/peterssurgical>>

INTRODUCTION

- 20% develop infection
- 5% need second operation
- Extra operations
 - Longer recovery
 - More complications
 - Increased health care costs

INTRODUCTION

- Health cost of infection
 - 26% of the 114,000 mastectomies per year will develop a surgical site infection (SSI's) [2]
 - **\$757 million** will be spent per year to treat SSI's.

COMPETITION

- **Biopatch®**
 - Releases CHG up to 7 days [3]
 - Successfully fights infection
 - Tailored for catheters, **not** drain tubes
 - Replace Biopatch® = Additional work & trauma

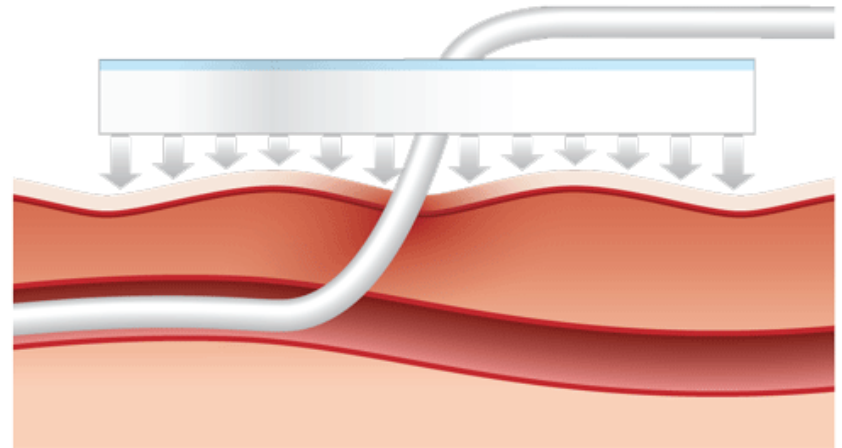


Figure 3. Diagram of a Biopatch® used on skin with a catheter. <http://www.ethicon360.com/products/biopa_tch-protectedisk-chg>

COMPETITION

- **Elutia®**
 - Silicone drain tube
 - Silver hydrogel coating [4]
 - Commercially available
 - Expensive



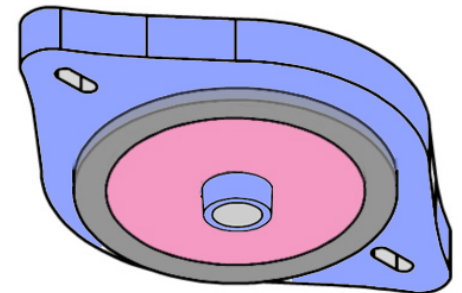
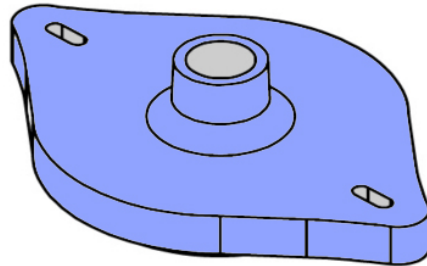
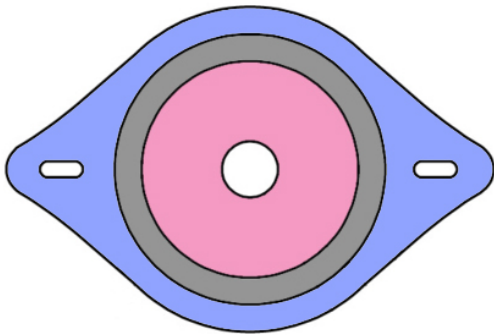
Figure 4. Elutia® drain tube.
<<http://bacterin.com/downloads/elutiasm.jpg>>

DESIGN CRITERIA

- Operate *in vivo* for 2 weeks
- Easy interface to currently available surgical drains
- Reduce wound dressing
- Biocompatible
- Easily manufactured

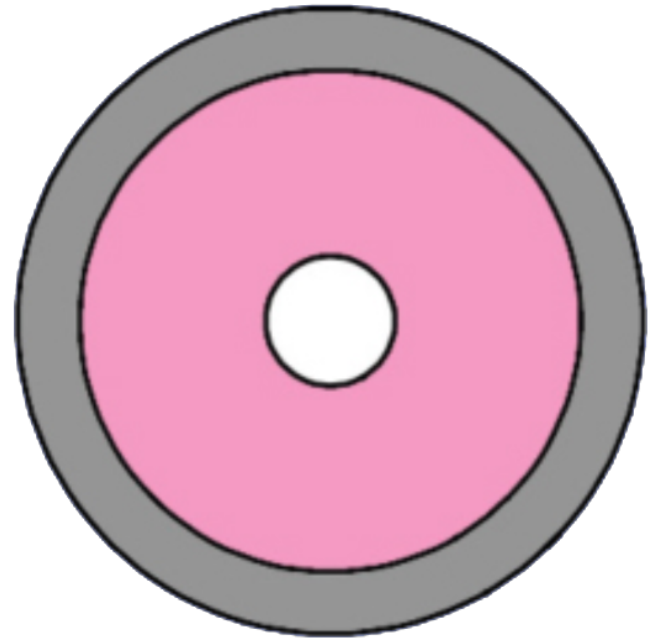
FINAL DESIGN

- CidalSeal™ incorporates foam and silicone cap



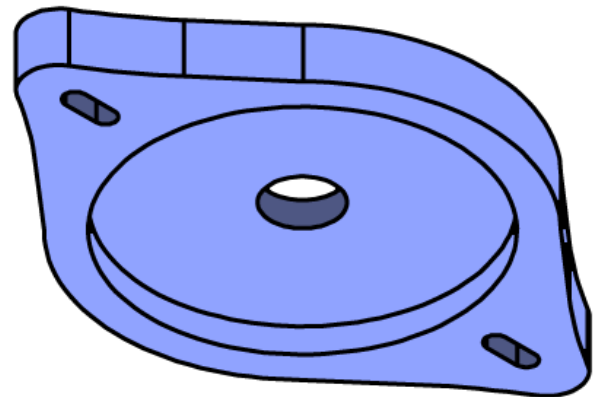
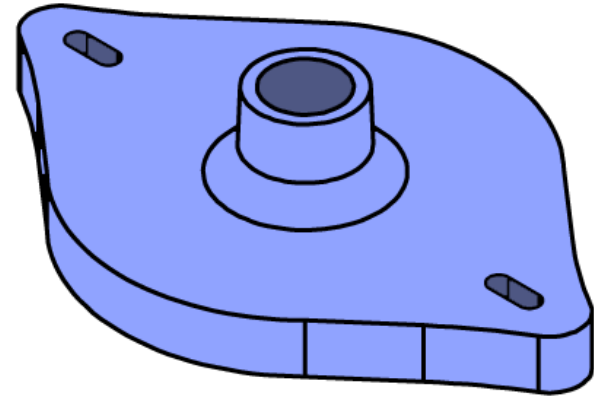
MICROCIDAL FOAM

- Superabsorbent polyurethane foam
- Concentric rings
 - Inside Ring
 - Impregnated 3% Chlorhexidine Gluconate (CHG)
 - Outside ring
 - Impregnated 1% Silver Sulfadiazene



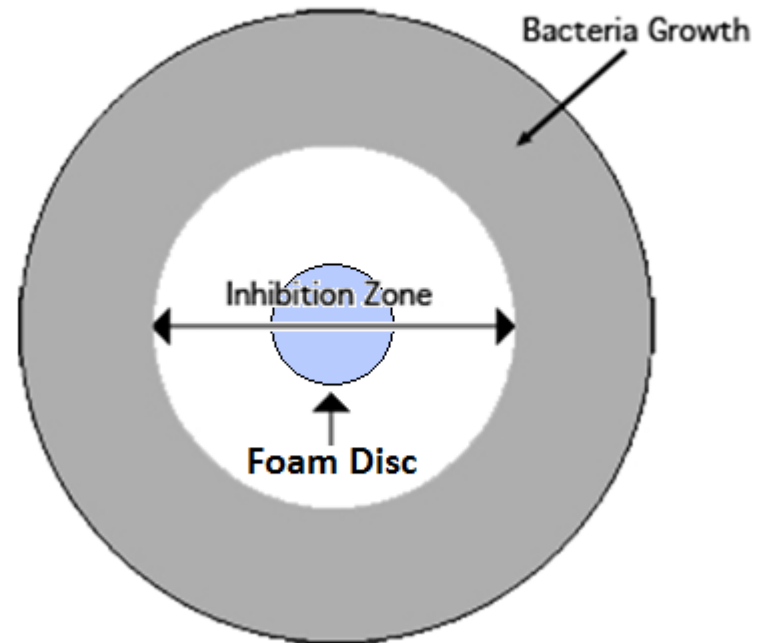
SILICONE CAP

- Ovoid Shape
- Suture Tab
 - Allows surgeons to secure CidalSeal™ to skin
 - No extra dressings needed
- Tube extension
 - Adds friction so drain tube will not migrate

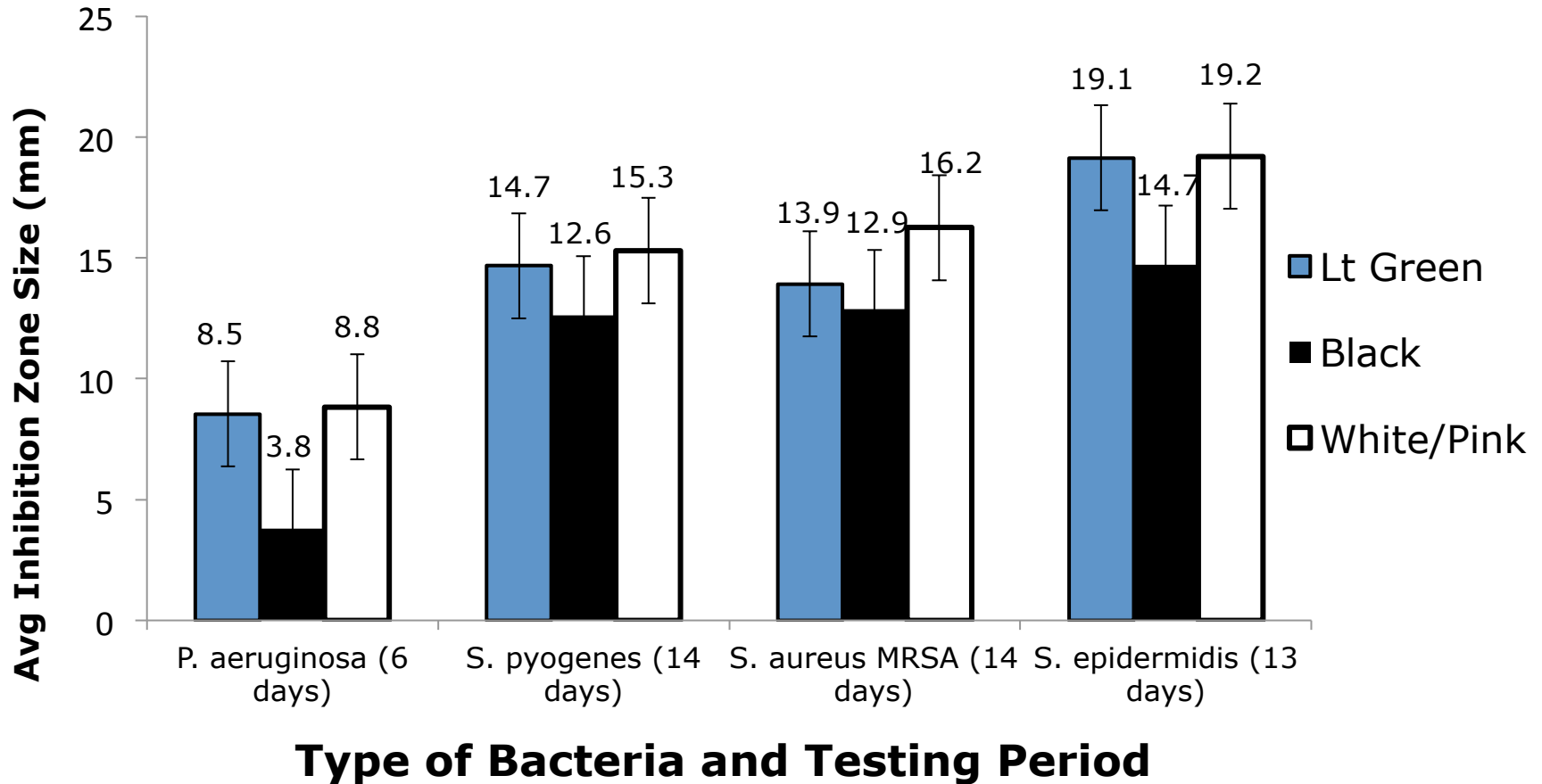


TESTING OVERVIEW

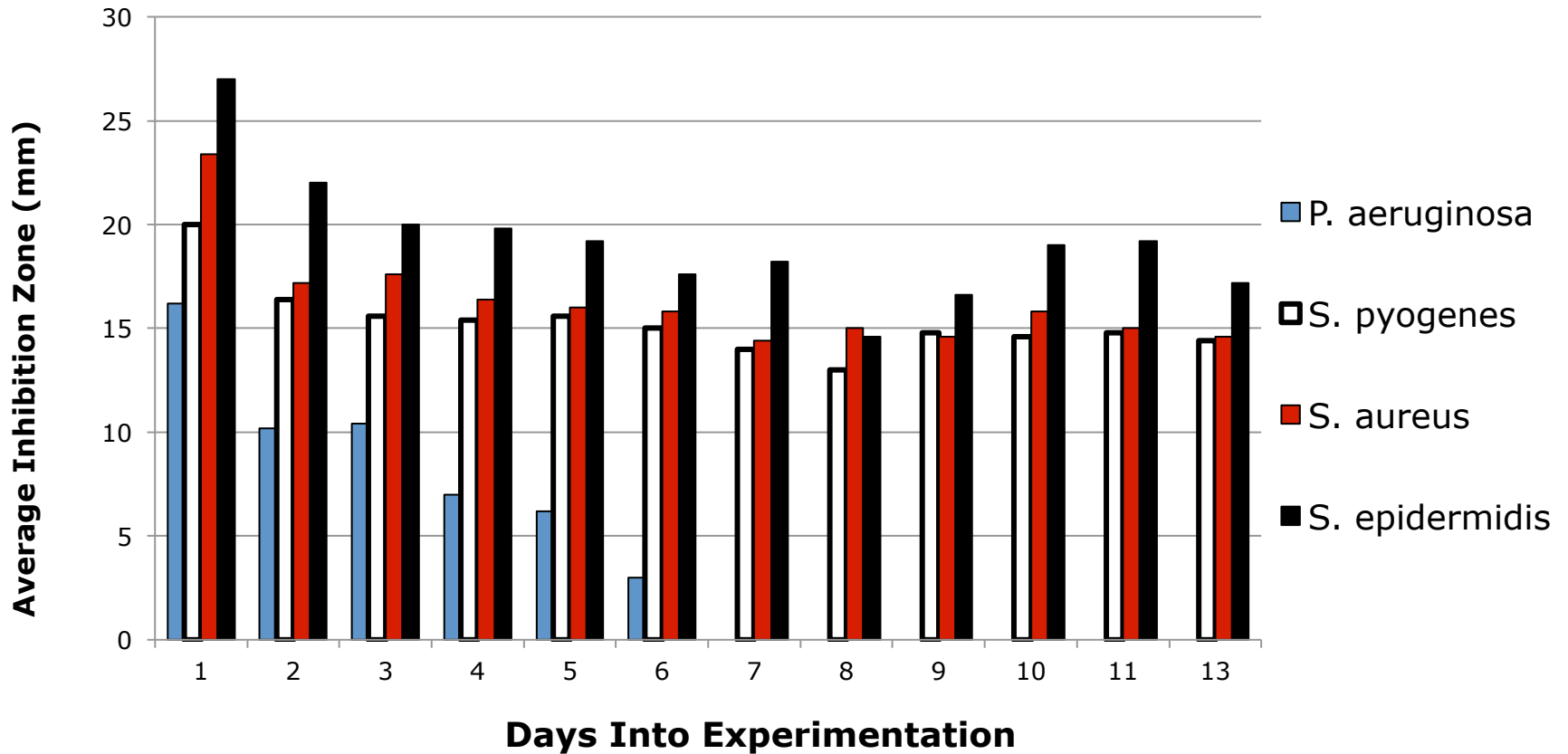
- Tested 3 different polyurethane foams
- Impregnated with 3% CHG
- 4 common infection causing skin bacteria tested
- Measured inhibition zone



MICROCIDAL ACTION OF 3 CHG IMPREGNATED FOAM OPTIONS



DAILY RESULTS FROM WHITE/PINK FOAM



FUTURE WORK

■ **Testing:**

- In vitro testing UW Hospital
 - Full-model testing
 - Bacterial tests for inhibitory effects of silver-impregnated foam

■ **Additions to final design**

- Multiple diameters for drain tubes
- Attachment clip

■ **Intellectual Property**

- Submit Invention disclosure report

■ **Manufacturing**

- Scale up from in lab to industry
 - Injection molding for silicone

REFERENCES

[1] "Postoperative Care; Wound Dressing and Drain Care." Cancer Services at Sutter Health. Web. 07 Mar. 2011. <http://www.cancer.sutterhealth.org/information/bc/notebook/postoperative_care.html>.

[2] Throckmorton, A., D., Boughey, J., C., Boostrom, S., Y., Holifield, A., C., Stobbs, M., M., Hoskin, T., H. (2009). Postoperative Prophylactic Antibiotics and Surgical Site Infection Rates in Breast Surgery Patients. *Annals of Surgical Oncology*. 16, 2464-2469.

[3] BioPatch: Protective disk with CHG. Ethicon 360. [online] Referenced Feb 27, 2011. <<http://www.ethicon360.com/products/biopatch-protective-disk-chg>>.

[4] Bacterin International. (2012, March 1). Elutia® drain tube. Retrieved from <http://bacterin.com/products/elutia/>

[5] <http://www.ctsnet.org/peterssurgicalTestingFinal>

QUESTIONS?