

BACKGROUND

- Biological sampling is at the central core of all analysis following a bio-release event
- Current surface sampling approaches, especially from porous surfaces such as concrete are generally inefficient (5-20% efficiency)
- Current sampling devices are not suited for 3-D surfaces
- The sample collection protocols are often unsuited to long-term preservation for forensics and diagnostic analysis.
- Bio-hydrogel is a water-based gel, which is applied as thick viscous material, and allowed to dry into a thin film within a few hours
- During the drying process, the gel encapsulates the bio-agent
- The dried film is then peeled off the surface (Figure 1)
- Bio-hydrogel was used to sample and preserve the encapsulated bio-agent off the contaminated surface

CONCEPT

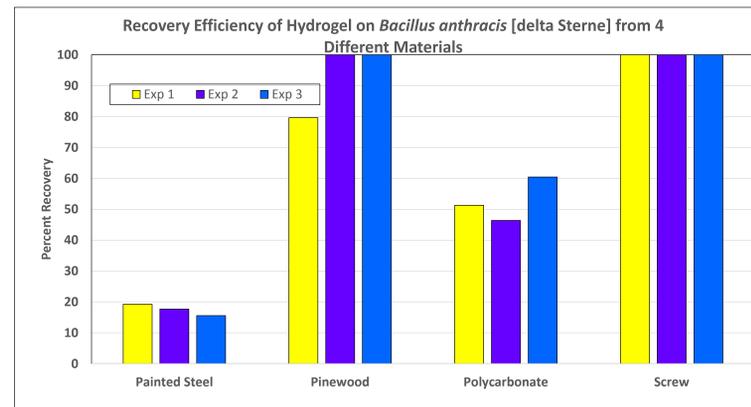
- This effort addressed two critical areas
- Sampling off a complex 3-D surface
 - Long-term preservation of sampled bio-agent

METHODS

- Coupons were inoculated with either *Bacillus anthracis* [Δ Sterne] or *Staphylococcus aureus*
- After spores or cells were dried on the coupons, the hydrogel was applied to the coupons, the gel dried overnight.
- After the gel was removed, it was placed in 20 ml of .01% Tween 80 and rehydrated after 2hrs in 37°C.
- Once the gel was rehydrated, the samples were diluted and plated and incubated at 37°C overnight.

RESULTS – SAMPLING

- Hydrogel proved to be a better sampling tool for 3D objects (screws), and pinewood than current sampling devices for recovery of *Bacillus anthracis* [Δ Sterne] (>80% recovery)
- Hydrogel seemed to be as good as a sampling tool for painted steel and polycarbonate as the current samplers, such as wipes, swabs, and BISKits (15 - 60%) for the recovery of *B. anthracis* [Δ Sterne] spores
- Hydrogel recovered 0.35% to 0% of *Staphylococcus aureus* off painted steel, polycarbonate, pinewood, and screws (results not shown)
- Hydrogel seems to be bactericidal for vegetative cells



RESULTS – PRESERVATION

- *Bacillus anthracis* [Δ Sterne] spores were preserved in the hydrogel at 4°C over 5 weeks on both painted steel and polycarbonate coupons
- *Bacillus anthracis* [Δ Sterne] spores did not survive in the hydrogel as well at 25°C and 37°C

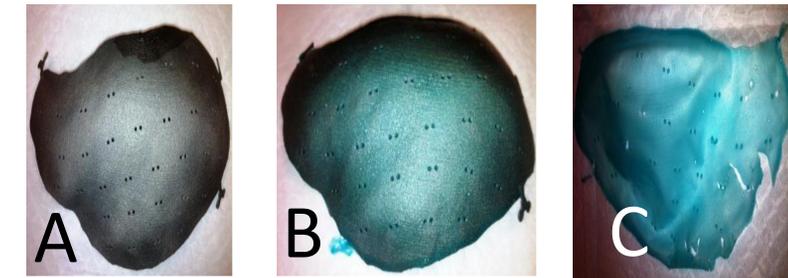
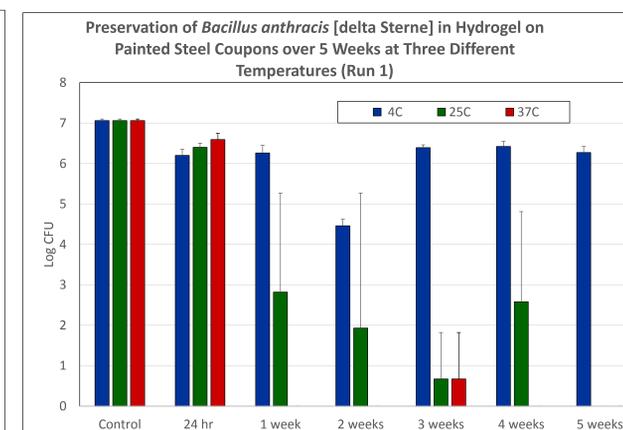
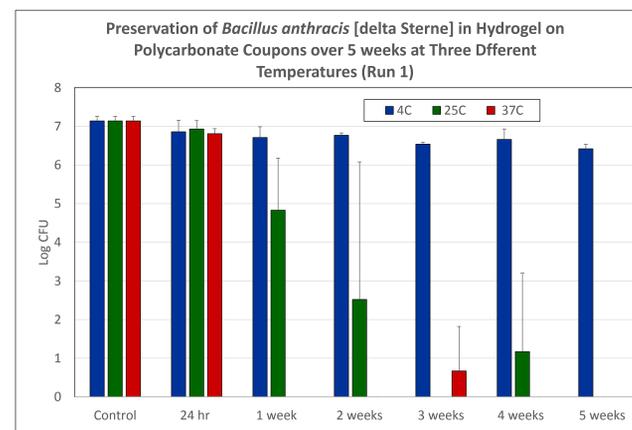


Figure 1. Complex object before and after removal of dried hydrogel film. Object without Gel(A), object coated with hydrogel (B), and the peeled film containing bio-agent (C).

CONCLUSIONS

- Hydrogel is an effective sampling tool for bacterial spores
- Unfortunately the current hydrogel can not be used to sample *S. aureus*, since it appears to be bactericidal
- The hydrogel could be used for preservation of spores for 5 weeks, if the samples are stored at 4°C.
- The spores may be germinating at 25° C and 37°C then the cells are dying in the hydrogel

FUTURE DIRECTIONS

- More experiments need to be done with the hydrogel and sampling on 3D objects
- A designer gel without the bactericidal agent needs to be made and the experiments with *S. aureus* (and other vegetative cells) need to be repeated