Novel *in-vitro* method to study bacterial interaction to contact lenses

L.W. Jones, A. Yee, A. Jabeen, D. McCanna, C. Phan, L.N. Subbaraman

Centre for Ocular Research & Education, School of Optometry & Vision Science, University of Waterloo, Canada

Introduction

- Bacterial adhesion to contact lenses (CLs) can lead to serious ocular infections. [1,2]
- *Staphylococcus aureus* (ATCC 6538) is a common gram-positive bacterium that is often isolated from both CL-related and non-related ocular surface infections. [1]
- Previous *in-vitro* studies have used a simple “soak” or closed vial method to assess bacterial binding to CLs. [2,3,4]
- We have developed a novel *in-vitro* drip method that may provide advantages over the standard soak model when determining bacterial binding.

Purpose

- To investigate bacterial adhesion to CLs using a novel *in-vitro* drip method.

Methods

- CL Material:
  - Hydrogel: 1-Day Acuvue Moist; etafilcon A (J&J).
  - Silicone hydrogel: Acuvue Oasys; senofilcon A (J&J).
- Glass eye-pieces were used as a raised platform for mounting the CLs for each method of exposure.
- Soak and drip methods were compared (n = 4 per method).
- Bacterial concentration was 1.0 x 10^2 CFU.
- The *in-vitro* drip method developed used:
  - Syringe pump (Harvard Apparatus, MA, USA).
  - Luer-Lok™ 10 mL syringes (Becton Dickinson, NJ, USA).
  - Nalgene™ silicone tubing (ThermoFisher Scientific, NY, USA).
  - Dispensed 5 mL of a bacterial solution at 5 µL/min for 16 hrs. The soak method also occurred for 16 hrs.

1.

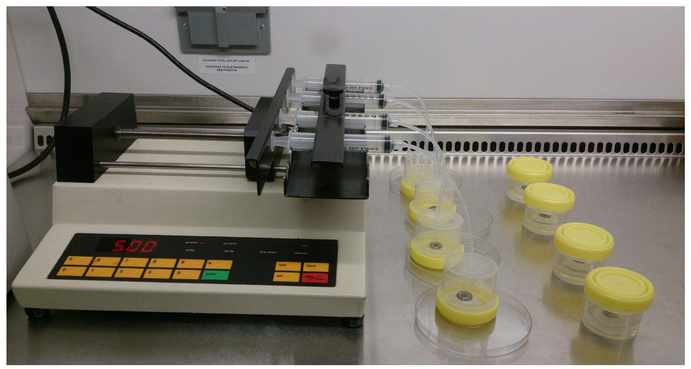
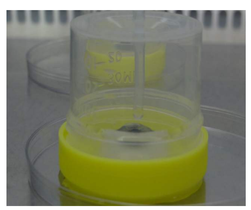


Figure 1. The drip model shown dispensing the bacterial solution. Both models were in a closed environment at room temperature.

2A.



2B.

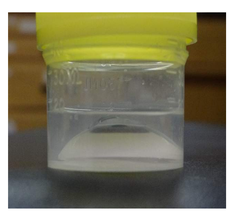
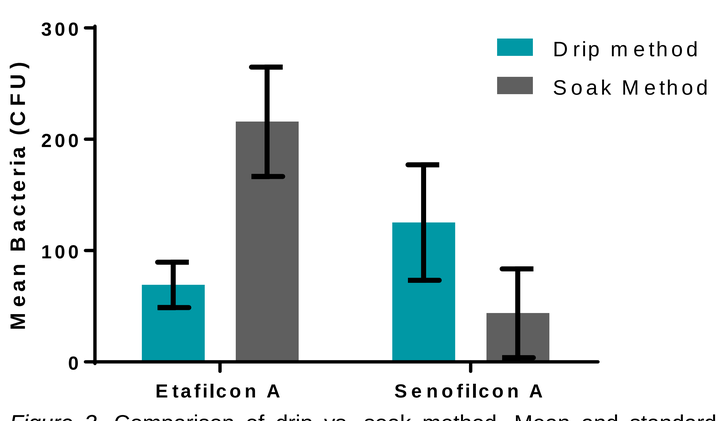


Figure 2. Close-up of the drip model (2A.) and the soak method (2B.)

Results

- Bacterial adhesion for both methods were assessed manually for both materials.
- Analysis was conducted using a two-way ANOVA, with CL material and method as the factors.



3. *Figure 3.* Comparison of drip vs. soak method. Mean and standard error shown.

- There were no significant differences for the two group factors:
  - Materials (p = 0.19) and methods (p = 0.45).
- There was a significant interaction between factors (p = 0.02).
- The post-hoc analysis of etafilcon A between the drip method (mean ± SEM, 69.25 ± 20.29) and the soak method (215.75 ± 49.02) was not statistically significant (p = 0.06).
- The post-hoc analysis of senofilcon A between the drip method (125.25 ± 51.82) and soak method (43.75 ± 39.78) was not significant (p = 0.39).
- The results suggest that the soak method may adhere more bacteria than the drip method for the etafilcon A material.
- Bacterial adhesion to senofilcon A is higher than the etafilcon A material using the drip method, but the reverse is true using the soak method.

Conclusions

- The *in-vitro* drip method is a promising alternative to the conventional soak method, as this model is closer to the contamination that would likely occur in a human eye.
- The drip method may be an acceptable method of testing once it can be further evaluated using a variety of materials and other bacterial strains.

References

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 Email contact for correspondence: a3yee@uwaterloo.ca