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Bacterial Growth on Contact Lenses: Links Between Lens Care and Bacterial Formation Patterns

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Reports of complications from bacterial infection of the cornea, including loss of vision, increased exponentially in the 1970's, shortly after soft contact lenses became popular on the market. Bacteria are capable of forming biofilms on the plastic polymers of contact lenses. Biofilms may consist of multiple bacterial types which work together resulting in resistance to antibiotics and disinfectants. The purpose of this research is to better understand the formation of bacterial biofilms on contact lenses by identifying the types of bacteria which grow on contact lenses under normal use and examining links between patterns of bacterial growth and lens care.

Each year, 30 million Americans will use contact lenses as a form of vision correction. Currently, the number of Americans using contact lenses is increasing exponentially. Compared to traditional glasses, contact lenses pose an increased health risk, since the lens is placed directly on the user's eye. [1]

Proper care of contact lenses greatly reduces the chances of ocular infection. However in a recent study, a sample population was observed caring for their contact lenses and 100% of participants were non-compliant with at least one of the eleven recommended contact lens treatment steps. [2]

Bacterial growth on contact lenses under normal conditions was tested by accepting used contact lenses from anonymous donors. Following their donation, donors were anonymously asked questions about the care habits of their contact lenses via an online survey. Questions asked include what types of lenses, case, and solution they use, how often it is used, how often they wash their hands before handling these materials, how much these materials are used, and how these materials are stored. The lenses obtained via donation consisted of a diverse sample of lens types and corresponding care habits.

Each of the acquired lenses were assigned a number and placed in separate vials of TSB broth. These vials were incubating at 37°C for 6-10 days to allow for the bacteria already present to multiply. Using a sterile Q-tip swab, the bacteria from each individual lens was streaked onto three separate media types for isolation. The media types utilized for isolation of the bacteria were SAB agar, R2A agar, and TSA agar. These plates were then incubated for an additional 4-7 days to allow for the growth of the isolated bacteria. Once the isolated bacteria had colonized, each bacteria sample was aseptically transferred to a slide and gram stained for viewing under a compound light microscope. Images of each slide were captured using an AmScope compound light microscope camera. Once imaged, the different bacterial types on each slide were identified based on physical characteristics.

Further testing was performed on bacteria types which could not immediately be identified based on physical characteristics. This testing consisted of re-streaking the unknown bacteria on R2A agar and attempting to grow the bacteria in the absence of oxygen. Growth, or lack thereof, in anaerobic conditions provided additional information in the determination of the bacteria's identity.

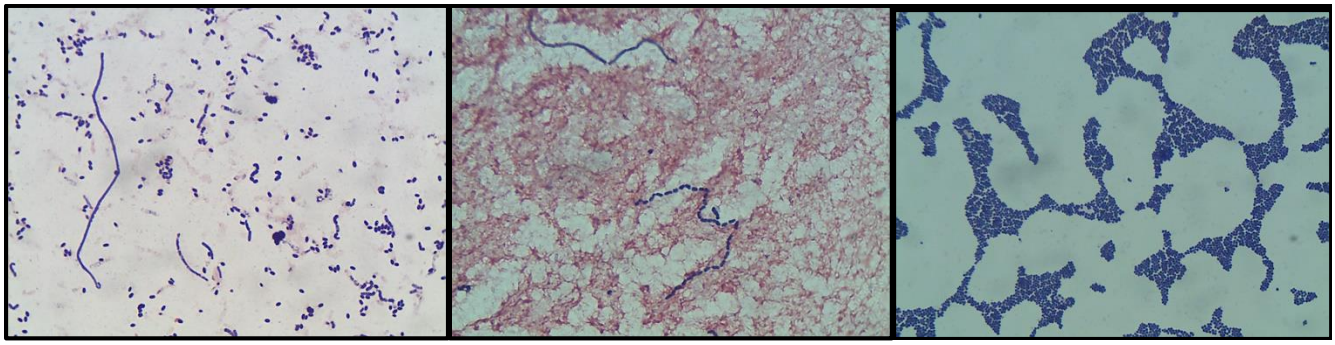
The ability to form a biofilm among different types of bacteria may influence pathogenicity, as many biofilms exhibit an increased resistance to antibiotics. The organizational structure of growth among the bacteria was determined by viewing each contact lens under a confocal microscope.

Many pathogenic bacteria which are commonly associated with ocular infection were found on the anonymously donated, used contact lenses. Images from the isolated bacteria types are included in Figure 1. Among the bacteria types found were *Staphylococcus* and *Pseudomonas*. These types of bacteria are both associated with bacterial keratitis, a clinical term used to describe the inflammation of the cornea due to a bacterial infection. Bacterial keratitis is a disease experienced most frequently by contact lens users. All contact lens samples which exhibited bacterial growth corresponded to a donor who indicated that they care for their contact lens case by rising it with tap water daily. The ideal method of rinsing contact lens cases is the same as the ideal method for rinsing the lenses themselves: with sterile saline solution. This agrees with prior studies linking an increase in the frequency of infection rates when treating wounds with tap water versus sterile saline solution. [3]

Among all contact lens samples incubated in TSB broth, the right contact lens either exhibited a noticeably greater amount of bacterial growth than did the left lens, or the right lens exhibited bacterial growth while the left lens did not exhibit any growth. This indicates that, among contact lens users, the handling method is not uniform between the right and the left contact lens. Among all donors who took the survey, it was admitted that they do not always wash their hands before handling their contact lenses. Donors claimed to neglect washing their hands before handling their contact lenses, on average, 2 out of every 5 times their lenses were handled.

References:

[1] Peng, Cheng-Chun, and Anuj Chauhan, Journal of Controlled Release **154.3** (2011): 267-274.
[2] Yung, Alice, *et al*, Clinical and experimental optometry **90.3** (2007): 190-202.
[3] Moscati, Ronald M., *et al*. Academic Emergency Medicine **14.5** (2007): 404-409.



A B C

Figure 1. The above figure includes three different types of bacteria obtained from three different contact lens samples. Sample A was identified as a gram-positive, pleomorphic *Corinobacteria,* which was isolated on a TSA agar plate. In Sample B, the lighter bacteria growing in the background was identified as a *Pseudomonas* bacteria, which was isolated on an R2A agar plate. Sample C was identified as a *Staphylococcus* bacteria, which was isolated on a TSA agar plate.

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