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# Potential for Biofilm Reduction in a Variety of Urethral Catheter Types

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## Introduction

Urethral catheter use for an extended period of time is linked to a higher risk of UTI and obstruction. It is common for microbial biofilms to block catheters, reducing their lifespan and significantly increasing the morbidity of UTIs. Developed for routine mechanical rinsing, a 0.02 percent polyhexanide irrigation solution has the potential to reduce or prevent biofilm formation and bacterial decolonization of urethral catheters. Nosocomial infections include infections of the urinary tract. The majority of the estimated 155,000 nosocomial urinary tract infections that occur annually in Germany, for instance, are associated with catheters. As with many medical devices that are inserted, catheters are particularly vulnerable to microbial biofilm formation. Catheters can be colonized by a number of different pathogens: species of commensal bacteria that originate in the gastrointestinal tract or ascend from the bladder, as well as bacteria that are transferred from the site of insertion [1].

## Description

Microbes in a biofilm are attached to the catheter surfaces in a way that makes gentle rinsing ineffective and necessitates mechanical removal. In point of fact, catheter biofilms frequently result in catheter encroachment and obstruction. Because antibiotics are rarely able to penetrate the biofilm's superficial layers, biofilms in catheters have significant health implications. When compared to planktonic, free-living bacteria, it is known that microbial biofilms are up to 1500 times more resistant to antibiotic treatment. The development of effective methods and compounds for the prevention of biofilm formation or their reduction is crucial because biofilms on catheters can result in significant complications and adverse health outcomes for patients. Polyhexanide also known as polyhexamethylene biguanide or PHMB is a polymer that is frequently used as an antiseptic. It has a wide range of antibacterial activity, is well-tolerated by tissues, and has not yet developed bacterial resistance. Polyhexanide has been used in a variety of ways to mechanically rinse and get rid of biofilms. A polyhexanide solution's ability to reduce and prevent biofilm formation in a variety of artificially colonized catheters was the focus of this study. The decolonization test used thirty (30) catheters of each type. To simulate the process of contamination with urine and organic materials, the catheters were irrigated with two x 400 ml of an organic load suspension (0.3 percent bovine albumin +3.0 percent urea, reagents from Carl Roth Germany) per day after being incubated with 5 ml of the mixed bacterial suspension for four hours at 37°C. Ten catheters were irrigated with 100 milliliters of Uro-Tainer 0.02 percent PHMB (B. Braun Medical, Switzerland) for five minutes after 72 hours, ten catheters were irrigated with 100 milliliters of Uro-Tainer 0.9% NaCl (B. Braun Medical, Switzerland) for five minutes, and ten catheters were left untreated (controls).

The microbial count was determined by irrigation of the catheters with 100 milliliters of a TLH-SDS neutralizer solution (0.1 percent polysorbat 80, 0.1 percent g/L lecithin, 0.1 percent histidine, and 0.2 percent SDS, all reagents from Carl Roth Germany) and membrane filtration on trypticase soy bean agar (TSA, Oxoid Germany) with a pore size of 0.45 millimeter Because the TLH-SDS solution neutralized the slightly acidic pH of the Uro-Tainer 0.02% PHMB (pH at 20°C of 5.5), no pH measurements were made for the rinsed filtrates. We anticipated that the pH of the filtrates would not affect the growth of the surviving bacteria because it would not change the pH of the culture medium used in this study. An estimation of the biofilm mass was carried out on the type E catheters after negative reduction factors were observed. As previously mentioned, thirty brand-new E catheters were artificially colonized. There were two options utilized for the decolonization: 100 milliliters of Uro-Tainer® containing 0.02 percent PHMB and 0.9% NaCl. Ten catheters were connected to each solution and clamped shut after being filled with liquid [2-5].

## Conclusion

Ten control catheters were left untreated. The clamp was released after five minutes of exposure, and the remaining liquid was flushed through the catheter. The catheters were then filled with 1% crystal violet and thoroughly rinsed with 10 milliliters of sterile, bi-distilled water to remove planktonic or detached cells. The catheters were once more thoroughly rinsed with 10 milliliters of sterile, bi-distilled water following an incubation period of 15 minutes at room temperature. After that, to get rid of the crystal violet from the biofilms that were still there, 2 milliliters of 70% ethanol were carefully poured through the catheter into a Sarstedt, Germany, acrylic cuvette.

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