# Antimicrobial Absorbable Uriprene® Ureteral Stent

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**Statement of Purpose:** Over the past several years it has been recognized that ureteral stents are commonly placed after routine ureteroscopic procedures to prevent acute ureteral obstruction.[1] Commercially available stents are made of non-absorbable polymers and their use is sometimes associated with significant clinical complications due to encrustation and infection which necessitate invasive procedures for stent extraction.[1,2] Meanwhile there have been a few attempts to resolve these complications by developing absorbable or "dissolvable" ureteral stents having brief residence time in the ureter and hence reducing the likelihood of encrustation and infection.[2-4] Unfortunately, none of the stents became a commercial product for different reasons and nowadays infection has become a more serious issue.[5] To address effectively the stent design and absorption profile, investigators in our laboratory developed, successfully, the absorbable/disintegratable composite Uriprene® ureteral stent.[6-9] Availability of the Uriprene® stent, growing interest in managing device-related infections, and our consistent interest in developing antimicrobial absorbable devices[10,11] prompted our pursuit of the present study. This deals with incorporating the broad spectrum antimicrobial agent triclosan in the matrix of a typical Uriprene® stent and evaluating its *in vitro* effectiveness in inhibiting the growth of *S. aureus*, a micro-organism commonly known to be responsible for urinary tract infection.

**Methods:** To incorporate Triclosan into the Uriprene® stent, an aliquot of the drug solution in acetone was mixed with a pre-made acetone solution of the matrix polymer to attain a total drug loading in the stent of about 1.6% (by weight). The drug-containing matrix polymer was used for impregnating the coil and mesh components of the stent as described earlier for its assembling.[6]

Uriprene® stent pieces (1/4 inch) were placed in tubes containing 2 mL of sterile, deionized water. At the specified time periods (t = 1, 2, 5 and 8 days), samples were removed from eluents and dried for further testing in bacterial growth inhibition studies. Eluents were also analyzed for triclosan content using established HPLC methods.[11]

In order to test the bacterial growth inhibition of the Uriprene® stent samples, a Tryptic Soy Broth was inoculated with *S. aureus* according to a 0.5 McFarland standard and cultured at 30 ºC. Uriprene Stent samples were placed on Mueller Hinton Agar plates streaked with *S. aureus*. Gentamicin (10 µg) and Tetracycline (30 µg) antibiotic discs were used as controls at concentrations consistent with their established MIC values. Plates were incubated at 37°C for approximately 18 hours. After incubation, zones of inhibition were determined for each sample by taking the average diameter of each zone.

**Results:** The HPLC data (Table I) based on the liquid eluents indicated a sustained release of triclosan from the stent for at least 8 days. The zone of inhibition data of the solid pieces of the stent summarized in Table I show a comparable or higher inhibitory effect compared with tetracycline or gentamicin controls, respectively. In spite of the fact that the inhibitory effect of triclosan persisted for 8 days and is likely to continue well beyond this period, the amount of the drug release in deionized water (as determined by HPLC) appeared to be considerably low at the conclusion of each period of testing. The apparent amounts of released triclosan in deionized water are very low relative to the initial loading of the drug in the stent. This may be due to the very low water solubility of triclosan.

Table I. Release and Growth Inhibition Data of Triclosan from Antimicrobial Uriprene Stent and Standard Antibiotic Discs as Controls

| Sample | Incubation Time (days) | Zones of inhibition (mm)* | Incremental weight of triclosan released, (microgram)[a] | Cumulative weight of triclosan released (microgram)[b] |
|---|---|---|---|---|
| Tetracycline control | N/A | 39.0 | N/A | N/A |
| Gentamycin control | N/A | 33.5 | N/A | N/A |
| Uriprene | 0 | 41.0 | N/A | N/A |
| | 1 | 41.3 | 0.33 | 0.33 |
| | 2 | 40.0 | 0.42 | 0.75 |
| | 5 | 40.0 | 0.39 | 1.14 |
| | 8 | 39.7 | 0.49 | 1.63 |

[a]This represents the determined amount released from ¼ inch test specimens at the conclusion of each period prior to replenishing the aqueous medium.
[b]Calculated total amount released at each period

**Conclusions:** Available results demonstrate that the Uriprene stent can provide a sustained drug release and displays a significant inhibitory effect on *S. aureus* for at least 8 days.

**References:**

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