

# Migration of Chlorhexidine Gluconate Under Antimicrobial Gel Pad of IV Securement Dressing to Provide Continuous Antimicrobial Protection

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## Purpose

The presence of a vascular access device provides bacteria a point of entry to the body, and places patients at risk for local and systemic infectious complications. A patient's own skin flora is considered to be a major risk factor for catheter colonization and infection for central venous catheters. The new 3M™ Tegaderm™ CHG (chlorhexidine gluconate) IV Securement Dressing integrates an antimicrobial gel pad with a transparent dressing that is placed over the catheter site. The challenge has been how to provide continuous circumferential antimicrobial protection without requiring manipulation of the catheter.

The purpose of this study was to demonstrate that the skin under the catheter is protected with CHG from the gel pad, that CHG is able to migrate under the catheter, and the rate at which this occurs. For this purpose, skin sites of subjects were dressed with antimicrobial CHG dressings over central line catheter sections and studied to determine the rate of migration of chlorhexidine gluconate to the skin under the catheter.

## Description of the Study

- This study was conducted according to an IRB-approved protocol.
1. The backs of 8 healthy human volunteers were prepped with two 30-second applications of 70% isopropyl alcohol.
  2. Eight sterile Tegaderm™ CHG dressings (1658) were placed on each subject's back. The gel pads were positioned over 2.5 cm catheter sections (Arrow, 7 FR polyurethane double lumen catheter) such that one end extended ~0.5 cm beyond the gel pad and 2 cm were covered by the gel pad. The volunteers were restricted from physical activities that would cause sweating or saturated dressings.
  3. Two dressings were removed after 1, 2, 4 and 7 days from each subject and Transpore™ tape was used to lift skin lawn samples from under the gel pad and catheter.
  4. The tape-skin lawn samples were analyzed for CHG by MALDI imaging.
  5. Results are expressed as ratios comparing the signal intensities under the catheter pieces to the intensities directly under the gel pads.

## MALDI (Matrix-assisted laser desorption/ionization) technique:

A mass spectrometry (MS) method in which a laser beam vaporizes the matrix coated over the sample (tape-skin lawn), ionizing the matrix and the CHG. The intensity of the signal relates to the concentration of CHG that was vaporized and ionized from the sample.

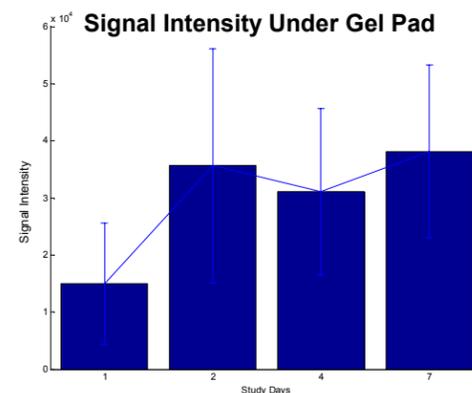
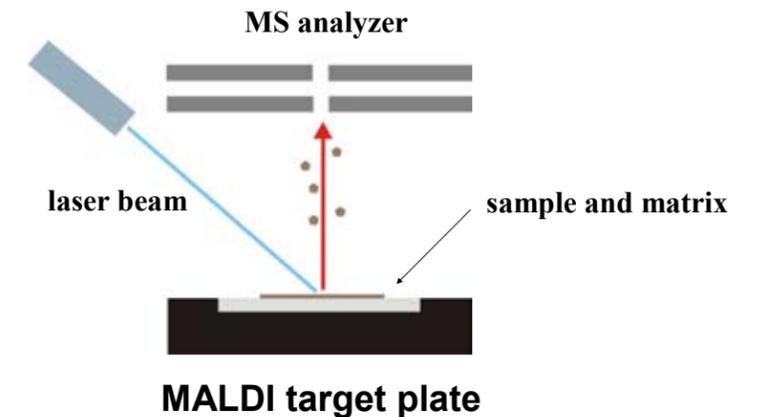


Figure 1. Average CHG signal intensities on skin-tapes taken from under gel pads (n=6).

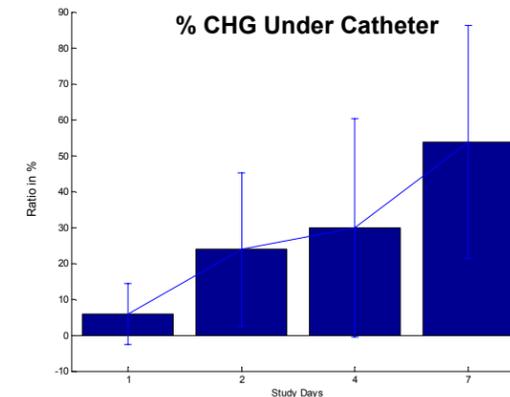


Figure 2. CHG on skin recovered from underneath catheters, shown as average ratios of signal intensities under catheter/gel pad (n=6).

## Results

- This novel method was successful in evaluating and demonstrating for the first time the presence of an antimicrobial agent (CHG) in very fine incremental locations on the skin (~1mm increments).
- Six of the 8 subjects completed this study. Two subjects did not complete day 7 of the study.
- Results are represented as a ratio (%) of the CHG recovered from under the catheter to CHG recovered under the gel pads.
- Skin recovered from under the catheters showed the presence of CHG for all subjects in 24 hours.
- Skin recovered from under the gel pads qualitatively reached a steady CHG level after 2 days wear.
- Average CHG ratios on skin under catheters increased with dressing wear time.
- Additional research is needed to further refine the methodology and improve the efficiency/uniformity of skin recovery.

## Discussion and Conclusions

Microbiological methods were assessed and lacked precision and sensitivity for this study. Agar methods are not true reflections of what happens on drier sites such as skin; cup scrub methods are applicable for large areas; and swabs have poor recovery. The MALDI analytical method was developed for its potential sensitivity in imaging CHG on skin recovered by tape lifting. The tape-skin samples demonstrated variable CHG recoveries as determined by MALDI analysis. However this variability appears related to the uniformity of the skin lawn on the tape. Too much skin and the CHG signal is reduced and appears buried; too little skin and the signal is also weak. The authors believe the precision of this method can be improved with more uniform skin sampling methods and the mean trends are indicative of substantial CHG migration.

This study was successful in demonstrating the presence of CHG on skin under catheter pieces. The amounts of CHG recovered reflect increasing levels with time, and underestimate the actual amount of CHG on the skin under the catheter. The use of the new 3M™ Tegaderm™ CHG dressing over a catheter site provides continuous circumferential antimicrobial protection without requiring excessive manipulation or intrusion under the catheter.