

## QUATERNARY AMMONIUM DISINFECTANT ISSUES ENCOUNTERED IN AN ENVIRONMENTAL SERVICES DEPARTMENT

### Study Summary

A recent study published in Infection Control and Hospital Epidemiology illustrated that several factors may impact the effectiveness of quaternary ammonium compounds (quats). The study demonstrated that microfiber, cotton and some disposable cleaning cloths can bind with quats which reduced the level of active in the quat disinfectant solution (either in the bucket or that expressed from the cloth) to levels significantly below that which would be required to achieve disinfection. The authors also investigated the accuracy of automated dilution control dispensers that were used to mix the concentrated quat with water to produce a working solution of 800 parts per million (ppm): the concentrations of quat delivered by these dispensers varied widely.

### Study Description

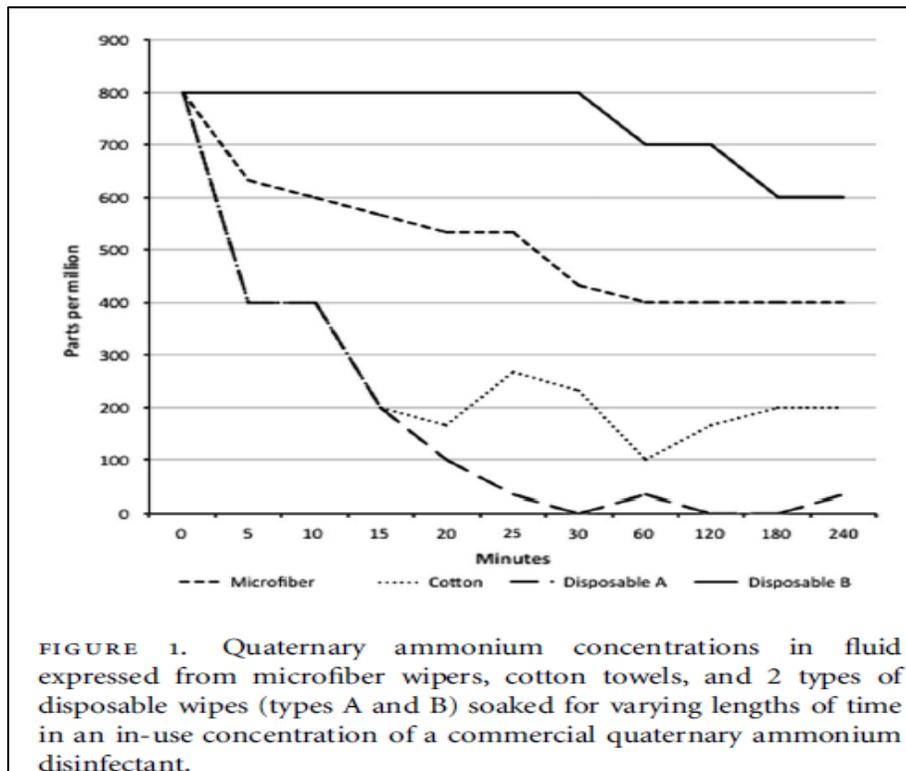
Buckets were filled with diluted disinfectant from a dispensing station. Microfiber cloths (80% polyester/20% polyamide blend), cotton towels and two different disposable cleaning cloths were tested (type A and B). Thirty (30) of each type were placed in the solution. Every five minutes for the first 30 minutes, a cloth was removed from each bucket and the disinfecting solution was expressed from the cloth and tested with a quaternary ammonium compound test strip. This procedure was then repeated every 30 minutes for four hours. Microfiber cloths and disposable wipe A were also tested after 30 minutes by pressing a test strip between the folded cloth, wiping a surface, and testing the solution deposited on the surface.

While filling the buckets, a variance was noted with the dilution of the concentrate to a working solution, which was supposed to be 0.5 ounce of concentrate into one gallon of water for an in-use concentration of 800 ppm. All 33 disinfectant dispensing stations were tested.

### Results

The first cloths to be tested after 5 minutes in the solution reduced the quat concentration by 21% in the microfiber and 50% in the cotton and disposable cloth type A. No reduction in quat was noted for disposable type B. After 30 minutes, the reduction in quat concentration stabilized, but over the remaining 3 hours the quat concentration was 400 ppm for the microfiber, 200 ppm for the cotton towels, near zero for the disposable cloth A and 600-700 ppm for disposable cloth B. It was determined that disposable cloth A was actually for use with solvents, and the composition of the wipe promoted quat binding.

Surface testing indicated that the concentration of the quat tested on the cloth was the same as was deposited on the surface, a reduced level of quat was 'released' to the surface once bound to the cloth.



The performance of the dilution control dispensers used for automated dilution of the quat varied widely as demonstrated in the details below. None of the 33 dispensers tested delivered the quat disinfectant at the desired level, and all failed to achieve the required 800 ppm of active in the solution. The difference in solution being dispensed was determined to be due to both water pressure to the dispensing station and certain design issues in the dispensing system. Installation of water pressure regulators on each dispensing station and modifications to the flow-control devices in the jugs of concentrated disinfectants resulted in quat concentrations >800 ppm.

- 1 Station was inoperative,
- 2 stations contained no concentrated disinfectant,
- 7 stations were delivering quat concentrations <200,
- 17 stations delivered 200-400 ppm,
- 6 stations delivered 400-600 ppm.

### Editorial Conclusions

This study identified several unique issues related to the use of quat-based disinfectants in a facility, including significant binding of the disinfectant with several types of wiping material, including cotton, microfiber and some disposable wipers, which has been supported by previous studies. Manufacturers test their products for efficacy of killing certain organisms as a predetermined dilution of a concentrate for a set contact time. Improper (over) dilution of a concentrate will potentially leave pathogenic organisms on the surface that was to be disinfected.

Based on this, it is important that facilities evaluate the effectiveness of their chosen disinfectant with their cleaning substrate of choice to ensure that they have selected a combination which is performing effectively.

The author highlights that this important phenomenon may not be widely recognized by environmental services and infection prevention personnel. In conclusion, healthcare facilities utilizing quat-based disinfectants should be aware that some wipers, towels, and wipes may reduce the quat concentration applied to surfaces to well-below the concentration deemed as effective by the manufacturer.

The other important finding in the study is that not all dilution control dispensers perform consistently, and that several factors may affect their performance (dilution accuracy) including design and variations in water pressure. Based on this, it may be reasonable for hospitals utilizing dispensing stations to periodically test concentrated solutions of disinfectant mixed with water to verify that appropriate in-use concentrations of product are being dispensed.

Possible options to address these concerns would be to:

- Use a chemistry that does not demonstrate binding with cleaning tool substrates (i.e., accelerated hydrogen peroxide, sodium hypochlorite).
- Use pre-wetted disposable wipes that has been demonstrated by the manufacturer through EPA or Health Canada registrations to be compatible with the disinfectant chemistry.

**Reference:**

Boyce JM, Sullivan L, Booker A, Baker J. Quaternary Ammonium Disinfectant Issues Encountered in an Environmental Services Department. *Infect Control Hosp Epidemiol* 2016;37(3):340-342