English translation of

Centre Hospitalier Régional Universitaire de Lille

La désinfection des nasofibroscopes Comparaison de l'efficacité d'une procédure par trempage *versus* une procédure par essuyage

ALIAS Association de lutte contre les infections associées aux soins

V[ème] Journée
31 mars 2015

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DISINFECTION OF NASENDOSCOPES

Comparison of the efficacy of a soaking method vs. a wiping method.

INTRODUCTION

Nasendoscopes are non-lumened endoscopes, frequently used for diagnostic activities in ENT. According to the Spaulding classification, nasendoscopes are classed as semi-critical medical devices through infection risk. They therefore require intermediate-level disinfection as a minimum, to achieve bactericidal, fungicidal, virucidal and mycobactericidal activity. The recommended disinfection procedure for these types of medical devices use soaking techniques (cleaning, disinfecting and rinsing), either manually or automated. The most widely used disinfectant in France for this level of disinfection is peracetic acid. The required contact time for peracetic acid, to disinfect medical devices, is 10 minutes. Alternatives to disinfection by soaking have recently been proposed to prevent the infectious risk related to nasendoscopes. Among them is a wiping method involving three steps: cleaning, disinfection with chlorine dioxide (ClO_2) and rinsing. The manufacturer claims a performance at least equivalent to the recommended procedure (soaking in peracetic acid) for non-lumened semi-critical medical devices as well as sporicidal efficacy in very short contact times.

Objective: To evaluate the bactericidal and sporicidal activity of the wiping method on an artificially contaminated nasendoscope in comparison with the peracetic acid-based soaking method.

MATERIALS AND METHODS

The tests carried out for this evaluation are based on the recommendations of the norms NF EN 14347 and 14561, after their adaptations relating to device constraints (nasendoscope) and to the wiping disinfection procedure.

Strains tested: E. *coli* CIP 54117, E. *hirae* CIP 58.55, P. *aeruginosa* 103497, S. *aureus* 4.83, B. *subtilis* spores CIP 52.62.

Contamination carrier: Olympus nasendoscope ENF type GP

Testing conditions:
- LAF, temperature 20 +/- 1°C, incubation: 37 +/- 1°C, neutraliser: DNP + thiosulfate.
- Contamination suspension: approximately 2.10(9) CFU/ml of bacteria and 2.10(7) CFU/ml of spores.
- Interfering substances: 3g/L albumin bovine.
- Culture medium: TSA.

Test procedure: see figure below.

Tristel

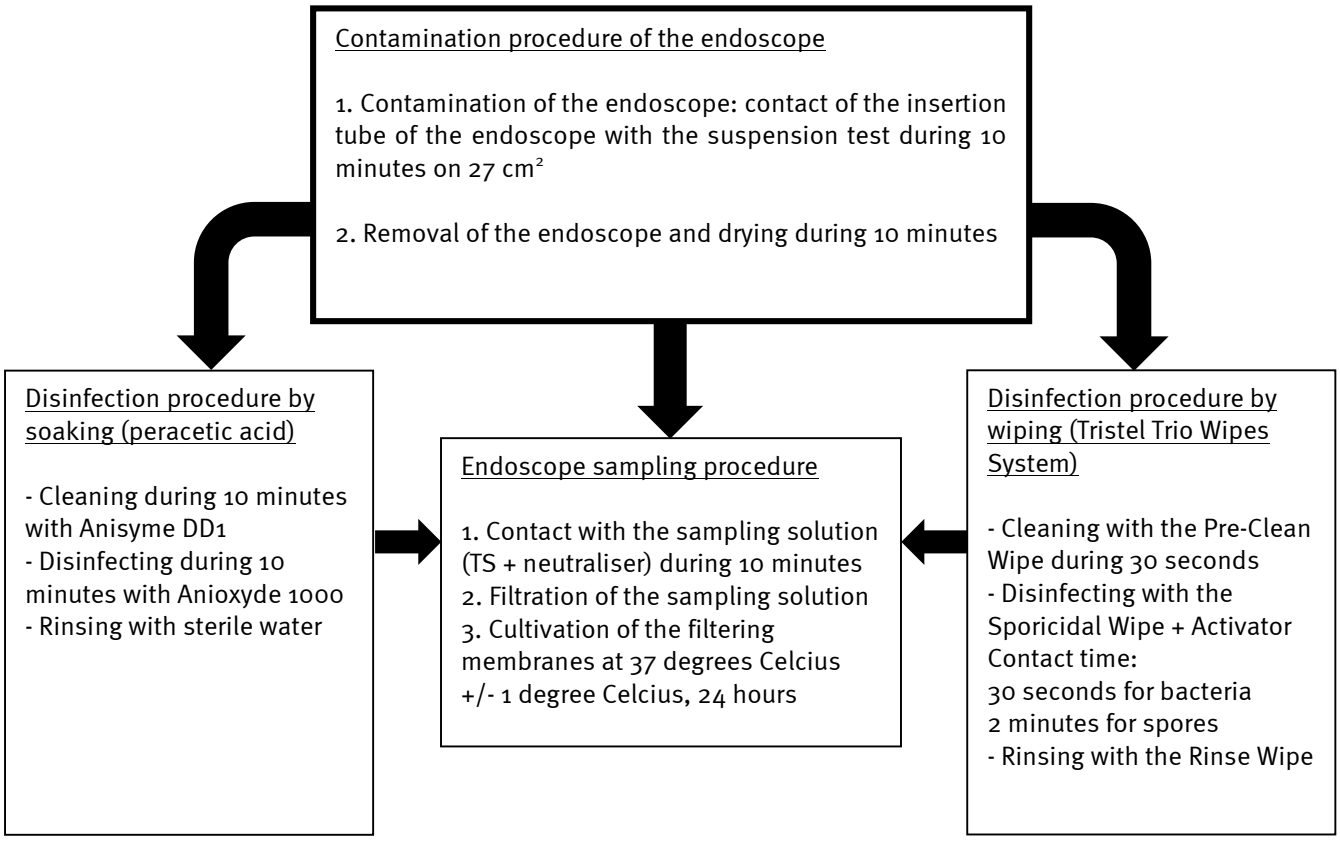

Figure I: Procedures and set-up of the contamination, disinfection and sampling tests.

The suspension tests utilised for the contamination were prepared and their concentrations validated according to the methodology of the standard NF EN 13727. The initial bacterial load of the endoscope was determined on two tests and the residual bacterial load was determined on three tests. Log_{10} reduction factors were calculated for each microorganism.

RESULTS

Below tables show the results of the contamination test and of its logarithmic reduction after the application of the tested disinfection methods. For all tested vegetative bacteria (P. *aeruginosa*, E. *hirae*, S. *aureus* and E. *coli*) the initial bacterial load was ›6log_{10} for both disinfection methods.
The application of the disinfection method by soaking allowed a reduction of the initial bacterial load of ›5log_{10} for the vegetative bacteria after a 10-minute contact time with peracetic acid. This reduction remained at ‹4log_{10} for B. *subtilis* spores.

Microorganisms	**Bacterial load of the nasendoscope (log_{10})**	**Contact time peracetic acid – nasendoscope**	**Reduction (log_{10})**
E. *coli*	6.4	10 minutes	›5.3
E. *hirae*	6.6	10 minutes	›5.5
P. *aeruginosa*	6.5	10 minutes	›5.6
S. *aureus*	6.2	10 minutes	›5.1
B. *subtilis* spores	4.4	10 minutes	3.3

Table I: Test results of the disinfection procedure by soaking (Aniosyme DD + Anioxyde 1000 + rinsing)

Microorganisms	Bacterial load of the nasendoscope (log_{10})	Contact time chlorine dioxide – nasendoscope	Reduction (log_{10})
E. *coli*	6.6	30 seconds	›5.5
E. *hirae*	6.4	30 seconds	6.4
P. *aeruginosa*	6.6	30 seconds	5.3
S. *aureus*	6.5	30 seconds	›5.4
B. *subtilis* spores	4.4	30 seconds	›3.4
B. *subtilis* spores	5.2	2 minutes	5.2

Table II: Test results of the disinfection procedure by wiping with the product Tristel Trio Wipes System

The application of the disinfection procedure by wiping (Tristel Trio Wipes System) reduced the initial bacterial load on the endoscope by more than $5log_{10}$ for all tested vegetative bacteria. After a 30-second contact time, the reduction remained at ‹$4log_{10}$ for B. subtilis spores. When the contact time was 2 minutes, the initial bacterial load on the endoscope was reduced by more than 5.2 log_{10}, thus highlighting the sporicidal activity of the Tristel Trio Wipes System procedure.

CONCLUSION

For this study, we used a nasendoscope as the contamination carrier to evaluate the bactericidal and sporicidal activity of the disinfection procedure with the Tristel Trio Wipes System. We have adapted the recommendations of NF EN 14561 (phase 2, step 2) for surface contamination ($27cm^2$ in our study) and for the sampling technique (without mechanical effect to avoid damaging of the endoscope). The disinfection procedure by soaking with peracetic acid was used as a "positive control". The initial bacterial loads of the nasendoscope varied from 6.2 log_{10} to 6.6 log_{10} for the vegetative bacteria and from 4.4 log_{10} to 5.2 log_{10} for the spores. These levels of initial bacterial loads were compatible to evaluate the bactericidal (›5 log_{10}) and sporicidal (›4 log_{10}) efficacy of both disinfection procedures.

In terms of the bactericidal activity, both procedures have demonstrated equivalent results in the contact times as recommended by their manufacturers (30 seconds for the wipes (Tristel Trio Wipes System) and 10 minutes for the peracetic acid. Sporicidal activity was only observed for the wiping procedure (Tristel Trio Wipes System) after a 2-minute contact time with chlorine dioxide. Similar results were observed for *Mycobacterium avium*, tested according to EN14563, where chlorine dioxide was mycobactericidal in 30 seconds. These results confirm the indications of the Tristel Trio Wipes System in the disinfection of non-lumened endoscopes both for the bactericidal/sporicidal effect and short contact times. These results are encouraging to consider an evaluation of the effectiveness of the Tristel Trio Wipes System in the clinical setting.

(1) Hernandez A., Carrasco M, Ausina V, Mycobactericidal activity of chlorine dioxide wipes in a modified prEN 14563 test. J Hosp Infect 2008; 384-388.