Properties of manual instrument disinfectants

Investigating the cleaning performance and protein-fixing properties of manual instrument disinfectants declared by the manufacturer as having cleaning activity

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The cleaning step is one of the most vital of all steps of the entire medical device reprocessing chain and is being ascribed increasingly more importance, especially against a background of transmissible spongiform encephalopathies . But, unlike when testing the disinfectant activity of disinfectants, there are no standards setting out which test method should be used to investigate the cleaning performance or should be invoked as a basis for declaration of cleaning activity. While aldehydes and alcohols are known to be protein-fixing substances, in the two-step study of the cleaning performance and protein fixation presented here it was noted that other disinfectant substances used for predisinfection of instruments also cause protein fixation and that disinfectants declared by the manufacturer as having cleaning activity were shown to, in fact, not be endowed with such activity. The aim of this publication is to present a method for testing the cleaning efficacy of manual and automated detergents and of disinfectants declared as having cleaning activity as well as to investigate protein fixation.

KEY WORDS
- instrument reprocessing
- cleaning
- fixation
- disinfectants

Introduction

This paper describes a method with which, in a two-step test procedure, both the cleaning performance and the protein-fixing properties of detergents or detergent disinfectants can be tested. In this two-step test procedure, the cleaning efficacy was first investigated and then in a subsequent standardised cleaning step the residual contamination was used to investigate to what extent this residual contamination could be removed, so that insights could be gained into protein fixation. The contaminated process challenge devices (PCDs) were exposed to the test solution using a glass beaker model Control tests were performed using water instead of the disinfectants with declared cleaning activity or using an additional comparative (control) test where only the second cleaning step was performed with the previously untreated test soil (i.e. the first cleaning step with exposure to the test disinfectants was omitted).

Materials and Methods

Process challenge devices (PCDs)

Roughened stainless steel PCDs (5 × 10 cm), which had first been thoroughly cleaned, were contaminated with 200 µl defibrinated sheep blood and left to dry overnight at room temperature (sheep blood: defibrinated by Acila of 30/12/2009 [Batch designation: 24017]). The stainless steel PCDs that had been weighed before contamination were weighed again after the blood contaminant had dried.

Test media

Three different instrument disinfectants used for manual disinfection and declared by their respective manufacturers as having cleaning activity were tested. The disinfectants are designated as

- «Disinfectant A» (basis: peracetic acid)
- «Disinfectant B» (basis: quaternary ammonium compounds)
- «Disinfectant C» (basis: active oxygen)

For control purposes, municipal water was used instead of the aforementioned disinfectants or an additional reference step was employed where the test soil had not been removed in the first step.

Test implementation

The test schema is shown in Fig.1. 2 % concentrations of (w/w) of the disinfectant use solutions were tested at room temperature. The exposure times were 5 and 10 minutes as per the manufacturer's instructions. Aliquots of 900 g of the respective use solutions were transferred to a 1,000 ml glass beaker and stirred with a magnetic stirrer, level 8. The PCDs were fully immersed in the solution and on expiry of the exposure time carefully rinsed with demineralised water. After leaving overnight to dry, the PCDs were weighed so that from the difference in weight versus the contaminated dried PCDs insights could be gained into removal of the test soil.

The same PCDs were then subjected to a further cleaning step using the same immersion bath methodology. This involved immersing the PCDs fully in a 55 °C hot 0.7 (w/w) solution of a mildly alkaline automated instrument detergent. The cleaning

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solution was stirred with a magnetic stirrer, level 4 (approx. 375 rms/min). After 2 minutes contact time the PCDs were carefully rinsed with demineralised water and once again left to dry overnight at room temperature.

Results

A summary of the results is given in Fig. 2. Testing of the three commercially available disinfectants, declared to have cleaning activity, demonstrated that they were less well able to remove blood in the first cleaning step than was municipal water. Likewise, removal of the residual contamination with a mildly alkaline detergent after the first cleaning step revealed that it was more difficult to remove the residual soils after exposure to the three disinfectants than when the first cleaning step was performed with municipal water or where this first cleaning step had been omitted.

Discussion

Since the cleaning performance of all three manual disinfectants tested was inferior to that of municipal water, it is recommended that the claims made by the instrument disinfectant manufacturers be reviewed. The disinfectants tested are ascribed properties such as «excellent cleaning activity» or «maximum cleaning activity», but in fact they do not even achieve a cleaning performance on a par with that of municipal water. Furthermore, in view of the results achieved and of the manufacturers' claims, there appears to be a need for defined standards or guidelines so that the vitally important cleaning steps of the instrument reprocessing chain can be better evaluated and the properties ascribed to disinfectants portrayed in a more realistic light. The two-step method presented here permits insights into both the cleaning performance and the protein fixation tendency of the test disinfectant.

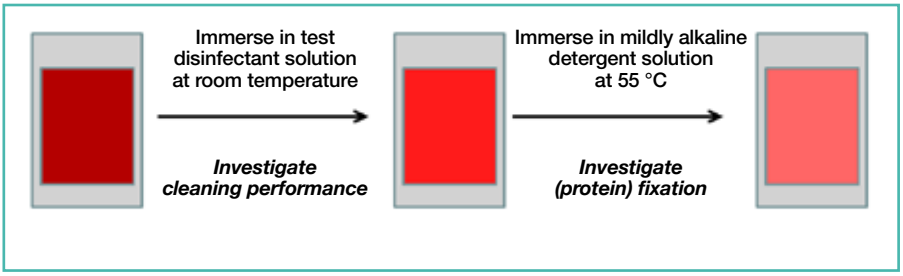

Fig. 1

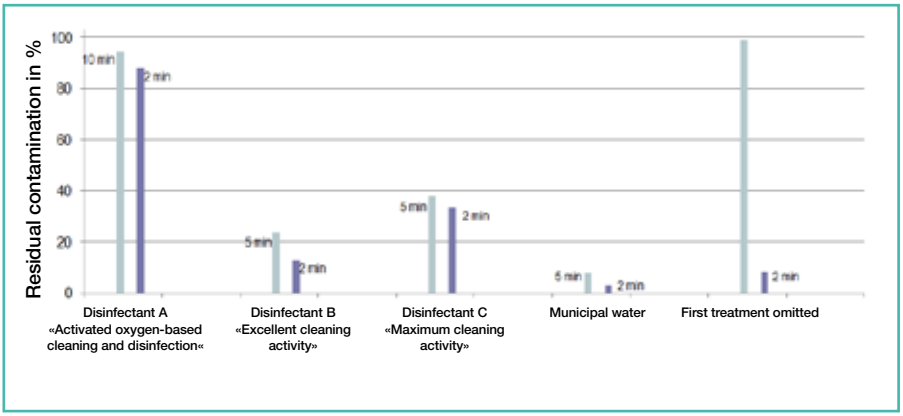

Fig. 2: The left bar shows in each case the residual soils as a percentage of the baseline contamination after the first cleaning step. Each right bar shows the residual contamination after the second cleaning step. Presented on the abscissa are the test media, followed by the properties attributed to them by their respective manufacturers.

A precondition to be borne in mind here is that after the first cleaning performance test step, the residual contamination can be evaluated only by means of a gravimetric or possibly optical method, since it must continue to be available for a subsequent test step to investigate the protein-fixing properties. ■

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