Cleaning disinfectants or disinfecting cleaners – what should be considered?

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TechnischeHygiene, Berlin
Cleaning disinfectants or disinfecting cleaners – what should be considered?

Heike Martiny
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Health Facilities Scotland
Decontamination Services Seminar
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May 2nd 2018, Glasgow
Processing MD
Germany

- As it should be
  - ........
  - Cleaning
  - Rinsing
  - Disinfection
  - Rinsing
  - ......
  - Sterilization, where required
Processing MD
Why using this products?

• To speed up?
  – .......
  – Cleaning disinfectants / disinfecting cleaners
  – Rinsing
  – .......
  – Sterilization, where required

• To protect staff from infections?
Effectiveness Verification

• Cleaners
  – No approved test methods
  – No approved specifications for the efficacy
  – No approved listing

• Disinfectants
  – Approved test methods
  – Approved specifications for the efficacy
  – Approved listing (DE: VAH, RKI, DVV, DVG)
Effectiveness Verification

• Cleaning disinfectants / disinfecting cleaners
  – Cleaning components
    • No approved test methods
    • No approved specifications for the efficacy
    • No approved listing
  – Disinfecting components
    • Approved test methods
    • Approved specifications for the efficacy
    • Approved listing (DE: VAH, RKI, DVV, DVG)
Interference of blood with the disinfectant process before washing

Eight TOSI indicators were immersed in each disinfectant solution at approximately 28 °C for 30 minutes and then washed under running water for 5 minutes. The indicators were then immersed in the 1% enzyme detergent at 37 °C and removed in pairs at 5, 10, 15 and 20 minutes after immersion. They were then washed under running water for one minute and dried at room temperature for a minimum of 3 hours. The effectiveness of cleaning was evaluated by visually observing the indicator surface after spraying with the Ninhydrin reagent.

Interference of blood with the disinfectant process before washing


<table>
<thead>
<tr>
<th>Disinfectant</th>
<th>High level disinfectants</th>
<th>Intermediate level disinfectants</th>
<th>Low level disinfectants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immersion time</td>
<td>No immersion in disinfectants (control)</td>
<td>Glutaraldehyde</td>
<td>Peracetic acid</td>
</tr>
<tr>
<td>After treatment with disinfectants</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>0 min (after staining)</td>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
</tr>
<tr>
<td>5 min</td>
<td><img src="image19" alt="Image" /></td>
<td><img src="image20" alt="Image" /></td>
<td><img src="image21" alt="Image" /></td>
</tr>
<tr>
<td>10 min</td>
<td><img src="image28" alt="Image" /></td>
<td><img src="image29" alt="Image" /></td>
<td><img src="image30" alt="Image" /></td>
</tr>
<tr>
<td>15 min</td>
<td><img src="image37" alt="Image" /></td>
<td><img src="image38" alt="Image" /></td>
<td><img src="image39" alt="Image" /></td>
</tr>
<tr>
<td>20 min</td>
<td><img src="image46" alt="Image" /></td>
<td><img src="image47" alt="Image" /></td>
<td><img src="image48" alt="Image" /></td>
</tr>
</tbody>
</table>

**Fig. 2:** Cleaning results obtained by immersing the TOSI in enzymatic detergent after immersion in disinfectants
Interference of blood with the disinfectant process before washing

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<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3: Cleaning results obtained by immersing the TOSI in alkaline detergent after immersion in disinfectants

Effectiveness of instrument disinfectants
Impact on dried blood

<table>
<thead>
<tr>
<th>Active Agent</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peracetic acid I</td>
<td>After disinfection</td>
</tr>
<tr>
<td>Glutaraldehyde I</td>
<td>After disinfection</td>
</tr>
<tr>
<td>QAC</td>
<td>After disinfection</td>
</tr>
<tr>
<td>QAC + Amines</td>
<td>After disinfection</td>
</tr>
</tbody>
</table>
Effectiveness of instrument disinfectants

Impact on dried blood

- **Fixating**
  - PAA-products
    - **92 % - 41 %**
  - GDA-products
    - **92 % - 76 %**

<table>
<thead>
<tr>
<th>Active agent</th>
<th>Product</th>
<th>Removal of blood [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peracetic acid</td>
<td>1</td>
<td>8,1</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>2</td>
<td>39,0</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>3</td>
<td>59,0</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>4</td>
<td>56,6</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>5</td>
<td>21,7</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>6</td>
<td>23,6</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>7</td>
<td>8,1</td>
</tr>
<tr>
<td>QAC</td>
<td>8</td>
<td>88,5</td>
</tr>
<tr>
<td>QAC</td>
<td>9</td>
<td>88,2</td>
</tr>
<tr>
<td>QAC + Amin</td>
<td>10</td>
<td>35,5</td>
</tr>
<tr>
<td>Phenol</td>
<td>11</td>
<td>90,3</td>
</tr>
<tr>
<td>Tensid</td>
<td>12</td>
<td>89,0</td>
</tr>
</tbody>
</table>

Effectiveness of instrument disinfectants

E. coli-biofilm in glass tubes

Cleaning efficacy

-100 -80 -60 -40 -20 0 20

0 -95 -62 -97 -34 -54 8 14

Fixation

- Water
- Biofilm dried, < 0.001
- GDA: Endosporine, < 0.001
- GDA: Cidex, < 0.001
- PAA: Nu Cidex, 0.01
- PAA: Anioxyde, < 0.001
- PAA+Quats: Hydraseptic, > 0.05
- PAA+Quats: Peralkan, > 0.05

Henoun Loukili et al; Effect of peracetic acid and aldehyde disinfectants on biofilm; J Hosp Infect 58 (2004)
Is peracetic acid suitable for the cleaning step of reprocessing flexible endoscopes?

Günter Kampf, Patricia M Fliss, Heike Martiny
Effectiveness
Review – Conclusion

However, we found no conclusive evidence to suggest that the cleaning capacity of any peracetic acid-based formulation was as good as that of detergent-based cleaning agents without biocidal agents.

Kampf G, Fliss PM, Martiny H; World J Gastrointest Endosc 2014
Effectiveness
Sporicidal activity

Effects of salt and serum on the sporicidal activity of liquid disinfectants
Sagripanti et al, J AOAC Internat 06 (1997)
Effectiveness Verification

• **Instrument disinfectants**
  – Required disinfecting efficacy (concentration per time)
    • Bacteria: 5 lg-steps
    • Yeasts, fungi, mycobacteria, virus: 4 lg-steps

  – Organic load tested
    • Clean conditions
      – 0.03% albumin
    • Dirty conditions
      – 0.3% albumin + 0.3% sheep erythrozytes
Cleaning disinfectants / disinfecting cleaners
Organic soiling

• 3 products
  – Aldehyde + aldehyde releasing agents
  – Alkylamine
  – Alkylamine + Qac

• Hinges of Crile-clamps
  – 0.1 ml sheep blood etc + \textit{E. faecium} \textit{10}^{10} \text{CFU/ml}
  – 1 h dried
  – 200 ml (each 15 min), agitated, neutralised

\text{Gebel et al., HygMed 33 Suppl 1 (2008); Untersuchungen zur manuellen Aufbereitung medizinischer Instrumentarien; TechnischeHygiene Heike Martiny}
Cleaning disinfectants / disinfecting cleaners
Organic soiling

Result
• ...The soiling represented a considerably higher challenge than „dirty conditions“...
• ...Despite the cleaning component the tested products did not show a sufficient disinfecting efficacy....

Gebel et al., HygMed 33 Suppl 1 (2008);
Untersuchungen zur manuellen Aufbereitung medizinischer Instrumentarien;
TechnischeHygiene  Heike Martiny
Cleaning disinfectants / disinfecting cleaners
Organic soiling

• 5 products
  – Aldehyde, aldehyde releasing agents
  – Alkylamine derivative
  – Alkylamine, quats
  – Qac, guanidine derivative, alkylamine
  – Peracetic acid combination

  – Hinges of Crile clamps and tweezer
    • sheep blood etc + *E. faecium*
    • 0, 15, 60 min dried
    • 200 ml (each 15 min), agitated, neutralised

Gebel et al., HygMed 35 Suppl 1 (2010); ESMRD: Einfluss von Blutanschmutzungen auf die Desinfektionsergebnisse
Cleaning disinfectants / disinfecting cleaners
Organic soiling

Result

• ..... The reduction varied from below 1 lg step to a total reduction...

Gebel et al., HygMed 35 Suppl 1 (2010);
ESMRD: Einfluss von Blutanschmutzungen auf die Desinfektionsergebnisse
Cleaning disinfectants / disinfecting cleaners
Organic soiling

• Studies of standardisation of the manual cleaning and chemical disinfection of medical equipment.

Patrick Haubrich,

• Untersuchungen zur Standardisierung der manuellen Reinigung und chemischen Desinfektion von medizinischen Instrumentarien
Cleaning disinfectants / disinfecting cleaners

Organic soiling

- 6 disinfectants A – F
- 4 cleaners G - J
- Test instruments
  - Crile clamps; surgical clamps; anatomic clamps
- Soiling
  - 9.5 ml heparinised sheep blood (with 10 % A. dest) with 0.35 ml
    *E. faecium* / *E. hirae* + protamine
  - 0.3 % albumine + 0.3 % sheep erythrozytes
- 11 different test designs
Cleaning disinfectants / disinfecting cleaners
Organic soiling

Testdesign II: Crile-Klemmen
Prüfanschmutzung: Schafblut + Protamin
Ausgangskonz. MW: 6,44 log_{10} ± 0,11 (n=4)
maximale Reduktion MW: > 5,44 log_{10}

<table>
<thead>
<tr>
<th></th>
<th>Produkt A (1,5%-15min)</th>
<th>Produkt B (1,0%-15min)</th>
<th>Produkt C (2,0%-15min)</th>
<th>Produkt D (2,0%-15min)</th>
<th>Produkt E (2,0%-60min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without drying into bath</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
</tr>
<tr>
<td>+ brushing inside bath</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
<td>n=2</td>
</tr>
</tbody>
</table>

Proofed reduction

Haubrich
Cleaning disinfectants / disinfecting cleaners

Organic soiling


Proofed reduction
Cleaning disinfectants / disinfecting cleaners

Organic soiling

- Result for No “D” (approved 5 lg: 2%, 15 min)

  successful only with test design IV

  - After dry storage (60 min, 20°C)
  - 30 s rinsing with flowing tap water
  - 2 x brushing; 10 min in enzymatic cleaner „J“
  - Disinfection
  - Rinsing
  - Neutralization
Effectiveness Recapitulation

• Cleaning disinfectants / disinfecting cleaners
  – Cleaner
    • No evidence for an efficacy
    • No evidence for the extent
  – Disinfectant
    • Evidence for an efficacy
    • Evidence for the extent
Conclusion

• A validated process is always needed to show, that after
  – Cleaning
  – Rinsing
  – Disinfecting

the target is met: sufficiently cleaned and disinfected items!!!!!