Surface Changes on Materials – a Holistic Approach -

Brisbane/2016; Dr. Ulrike Weber
Surface Changes on Materials
And other discoloration

Autumn colours
Surface Changes on Materials
And other discoulouration

Autumn colours

Overview: three possible reasons for discolouration

1. Reprocessing cycle – Various factors
2. Typical contamination in medical environment – Organic load
3. Discolouration of steriliser chamber walls - Some explanations
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Surface Changes on Materials

Key goals of instrument reprocessing

- Protection of patients
- Protection of healthcare workers
- Value retention of instruments
### Protection of patients
- Approximately 200,000 cases of HAIs occur each year in Australia*
- Foundation principle of infection control: following of standard precautions (regardless of the known or perceived infection status of the patient)**

### Protection of healthcare workers****
- Worldwide over 59 million healthcare workers
- Complex variety of health and safety hazards

### Value retention of instruments
- Instruments are a major asset and represent a significant share of the total capital investment of a hospital.**

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**Sources:**
* NHMRC. Australian guidelines for the prevention and control of infection in healthcare (2010). Canberra: Commonwealth of Australia; 2010
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**Overview:** three possible reasons for discolouration

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Surface Changes on Materials
Reprocessing cycle – Various factors

- Instrument design
- Soil
- Load carriers
- Water quality
- Washer-disinfector
- Manual pre-cleaning
- Process chemicals
- Parameters (time and temperature)

Source: nibis.de
Imponderables in instrument reprocessing

Surface Changes on Materials
Reprocessing cycle – Various factors

Impact of pre-treatment

Interaction between factors
Surface Changes on Materials
Reprocessing cycle – Various factors
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Cleanliness – But what is dirt?

- The wrong material
- In the wrong place
- At the wrong time

Surface Changes on Materials
Typical contamination in medical environment – Organic load
Surface Changes on Materials
Typical contamination in medical environment - Organic load

Constitution of blood

Source: http://anaphyteachushowtoblog.blogspot.de/
“Collection and publication of expertise relating to the safety and value retention of the instruments”

“Sufficient cleaning standards are absolutely vital for successful sterilization.”

“During daily use and over time many medical products are subject to surface changes due to chemical, thermal and/or physical impacts.“

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Surface Changes on Materials
Risk Assessment

Risk Assessment – organic residue as a type of surface change

Optical alteration
Rust and/or blood coloured deposits can often be seen
## Surface Changes on Materials

### Risk Assessment

### Risk Assessment – Organic residue as a type of surface change

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| Rust and/or blood coloured deposits can often be seen | ▪ Operational residues (blood, protein, salt and drug residues)  
▪ Operational residues due to mistakes in reprocessing programs (e.g. water quality, detergent)  
▪ Interval between use and reprocessing is too long  
▪ Water feed temperature being too high (> 50 °C) in first rinse phase | ▪ Hygiene risk  
▪ Danger of infections for patients  
▪ Can lead to corrosion (blood contains chloride ions) |

## Risk Assessment – Silicates as a type of surface change

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| Yellowish-brown to blue-violet discolorations of various forms | ▪ Passage of silicon dioxide in the production of fully demineralized water  
▪ Carry-over of detergent residues containing silicates into the final rinse of automated reprocessing due to insufficient intermediate rinsing | ▪ No corrosion  
▪ Cosmetic effect  
▪ No findings indicating a patient risk  
▪ May make visual inspection difficult |

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Discoloration of steriliser chamber walls – further reasons

Overview: reasons for discolouration on steriliser chamber walls

- Low quality of water/steam
- Rouging
- Chamber surface not in conformity to standards
- Residues of indicators and stickers
- Chemical aggression through insufficient chemicals for cleaning of chamber and trolley's
- Further reasons
Chromoxide layer

Iron  Chromium  Atmospheric oxygen
Danger for Chromoxide layer

- Long time exposure with hot, low in oxygen and very clean water
- Physiological saline solution
- Blood
- Water with chlorine concentration > 120 mg/l
- Some antiseptics and disinfectants
Chromium and iron ratio

As a result: Ratio of chromium and iron is destroyed

Chromium oxide layer has more chromium $\rightarrow$ more corrosion resistant

Chromium oxide layer has more iron $\rightarrow$ more prone to corrosion
Surface Changes on Materials
Risk Assessment

Risk Assessment – Discolouration of steriliser chamber walls

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Currently no findings indicating a patient risk. May make visual inspection difficult. Further investigation is needed.
In case of (visual) material changes – think about the whole process

The reason for reprocessing (contaminated instruments) is already an opportunity for discolouration

Discolouration on equipment - further investigations about side effects (e.g. influence of steriliser chamber walls) are necessary

Main goals: cleaned, disinfected and sterilised instruments and retention of instruments and equipment
I hope to see you at the WFHSS congress in Germany in autumn next year