

# Evaluation of Corrosion Effects on Surgical Instruments

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## Conclusions

- Corrosion represent a common issue in hospitals
- Different evaluations of risk situation triggered further research
- high refurbishment costs can be avoided by process optimization

## RISKS

- in the literature some case studies indicate a relation between post operative wound healing disorders and instrument residue
- **randomly selected corroded instrument analysis shows significant amounts of carbon and indications for patient residue**
- amounts of protein range to critical amounts close to 100µg

## ROOT CAUSES

- **Water Quality** can be identified in standardized simulations as a root cause for corrosion => demineralized water according to EN285 is a prerequisite to avoid corrosion
- other identified root causes are **lack of lubrication** (friction corrosion) and **cleaning performance**

## Literature Analysis of Instruments as cause of Infections

### Limited literature situation

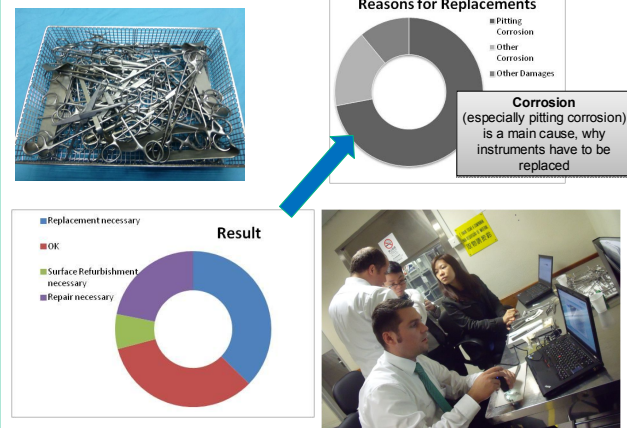
- Research typically done upon raise of post-operative wound infections
- in some cases links to instrument residue/ corrosion were found
- however no full proof of root causes cause is possible

### Examples

- Seattle Children's warns of potential infection risk due to "debris" on instruments  
<http://www.seattletimes.com/seattle-news/health/seattle-childrens-bellevue-clinic-warns-of-exposure-to-potential-risk-of-infection/30.08.2015/09:05:59/>
- **Dancer (Scotland)** reported about contaminated instruments after faulty packaging and sterilization  
Stephanie J. Dancer, Chirurgische Wundinfektionen im Zusammenhang mit kontaminierten chirurgischen Instrumenten, Zentralsterilisation 2013;2: 134-135
- Infections with *Pseudomonas Aeruginosa* were reported and linked to improperly cleaned shaver handpieces in the US in 2012  
Eaton J. Filthy surgical instruments: The hidden threat in America's operating rooms. Iwatch News, 22.02.2012.  
<http://www.iwatchnews.org/2012/02/22/8207/filthy-surgical-instruments>
- Marmalis described metal oxide as one root cause of the Toxic-Anterior Segment Syndroms (TASS) in eye surgery.  
Marmalis N, Edelhauser H, Dawson D, Chew J, LeBoyer R, Werner L. Toxic anterior segment syndrome. J Cataract Refract Surg. 2006; 32

## More than 200 Instrument Sets Inspections performed

Results of 14 recent European inspections

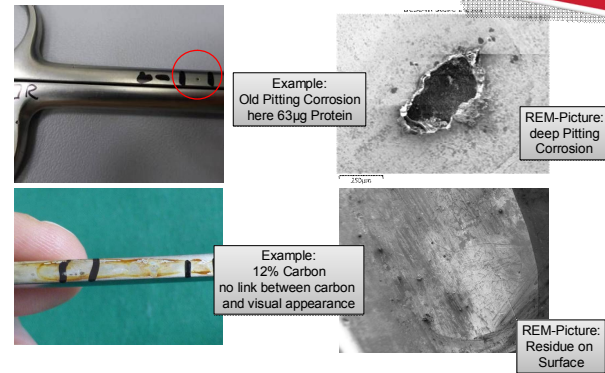
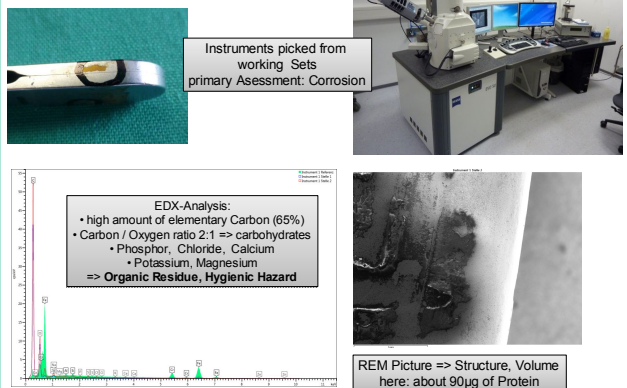


## Examples



## Laboratory Analysis of Surface Changes

- REM-Picture: Structure / Dimension
- EDX Analysis

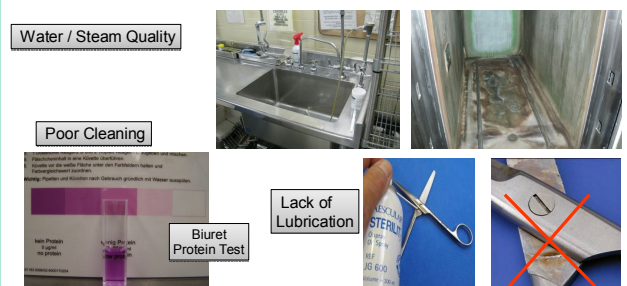


### Results:

- In 24 of 34 analyzed instruments, the elementary carbon content of residue was more than 10%
- Co-Elements like Nitrogen, Sulfur, Potassium frequently point towards organic / patient residue

## Root Causes of Surface Changes

(most frequent, out of over 100 process optimizations)



## Simulation of water quality as root cause

