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What is the best condition of transportation between Operating Room and CSSD?

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AKI - MD reprocessing working group Authors of the "Roten Broschüre" ("red manual")





The Question



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Reprocessing after use/transport

Objective

- Standardized and efficient work
- Cleaning support
- Avoiding damage and changes to surfaces

Who does what and when?

- \Rightarrow "Red manual" recommendation
- Point-of-use pretreatment
- Disassembly
- Dry / wet / immersion transport
- Protection during transport
- Maximum transport time: 6 hours









Different recommendations



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	AAMI (USA)	KRINKO (DE)	RED MANUAL (AKI)
Pre-treatment	Wipe off heavy soiling	Wipe off soil / rinse	Wipe off heavy soiling etc.
Disassembly	In CSSD	-	In the OR
Transport	Wet (damp cloth, spray, etc.)	-	Recommend dry transport
MD protection	Closed container "contaminated"	Avoid damage	Careful handling, special storage for fine instruments
Maximum transport time	Immediately, as soon as possible	Avoid delays	As soon as possible, max 6h

"...use the proper processes ..."

Trends/ challenges

- Centralization of CSSDs
 ⇒ Longer transport times
- Faster OR changes
- \Rightarrow Less focused on MDs

What to do?



What does the literature say?



- K. Bungaard et al. (wfhss 2019)
 - Dry transport
 - Waiting time with zero impact on cleaning results
 - Slightly more corrosion
- D. Perrett, London (WFHSS 2016, ..)
 - Keep moist with little water
 - If wet, cleaning after 48 hours possible
 - Optimal: cleaning within 1 hour
 - Cleaning foam leaves residue
- I. P. Lipscomb (Journal of Hospital Infection, 2007)
 - Protein dry after 1 hour
- H. Biering (Zentralsterilisation, 2010): Sprays
 - Sometimes gel formation, difficult to clean
 - Little effect on MDs

Thoughts:

- Long waiting times make cleaning more difficult
 - Depends on soiling?
 - Depends on geometry?
- Residues cause corrosion



(images: Perrett)





What do we know? - Residual soiling

SGSV SGSV SSSH So SSSO So

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Visible soiling is just the tip of the iceberg **=> Geometry matters!**



Cleaning





Residue! => Re-cleaning



Visually ok => Sterilization



Outside





Inside

Cleaning process complete!



Risk of corrosion



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Soiling varies greatly

- Blood (not the biggest problem!)
- Saline solutions .
- Fats, bones .
- Mucus, sugar solutions .
- Disinfectants .
- Mixtures

Often very corrosive!



20mg/l Chlorid, 1h

Corrosions and residual soil inextricably linked! (Wfhss 2015 !)



Corroded medical devices from sets from 7 hospitals around the world







250µm



Daily life - unresolved issue

SGSV SSSH SSSO

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Set packed in a university hospital in Germany





Re-cleaning in a reprocessing unit



Tomorrow



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The best strategy for reprocessing and transport? -Global process



Transport time/state



Manual pre-clenning



Automatic cleaning

Cleaning at the point of use

Multi-centre lab study

- Test soiling
- Geometry
- Transport conditions
- Waiting time



- Re-cleaning
- Clinical study
- Recommendation of a practice
 - strategy (more than one)
 - Cleaning at the point of use
 - Transport routes
 - ••••



Design of the laboratory study

SGSV Schweiz SSSH Société SSSO Société

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Test soiling

- (Heparinized sheep blood with 10% water)
- Sheep blood reactivated with 10% water
- Reactivated sheep blood diluted to 66% with 0.9% NaCl
- Reactivated sheep blood diluted to 33% with 0,9% NaCl
- 0.9% sodium chloride in water
- Purisol solution (polysaccharide)
- Braunol blood(50%/50%)
- Browne soil test

Drying

1 hrs

3 hrs 6 hrs

16 hrs

24 hrs

72 hrs

Geometry

• Test plates





- Process control device (PCD)
 - 22mm x 8mm closure
 - 0.25 mm slot

Tests

- Visual
- Protein (BCA) after standard cleaning (slightly alkaline, 5 min, 55°C)
- Berlin Blue
 (free ferrous ions)







Transport conditions:

- Dry
- Wet (wet cloth (200ml) in container)
- Wet (plastic bag with 20ml of water)
- Immersion (enzymatic detergent)
- Various Sprays (20 jets / Aniosyme First set, Anios / Neodisher PreStop, Dr.Weigert / Deconex Foam, activeN / Protect, Belimed



Drying plates



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Soil 2 blood with 66% NaCl 0,03 0,025 0,02 0,015 0,01 0,005 0 1 3 6 16 24 72



After 6 hours no more change in weight, most of them completely dry after 3 hours







Fresh NaCl rinsed

24 hrs

Soil test

rinsed

dried blood



DEP drying / wet transport

SGSV SSSH SSSO Sa

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Spray: similar drying, sometimes



PCD: similar behaviour



Wet transport: up to 16 hours/24







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- Without lubrication,
- 100µl test soil pipetted into the slot
 - open and close 5x
 - No difference between open or closed transport
- Spray/immersion treatment after 30min
 - Waiting time 1h 3h 6h 16h 24h 72h
- Clean in WD, 90° open cleaned
 5 min, 55°C, 0.5% Mediclean forte in softened water
- Test tube elution with Vortex, BCA protein measurement





Spray with additional layer of MDs





Cleaning result, dry transport





- No significant increase with duration of transport for Browne Testsoil: ruled out
- Blood-based soils: outliers (above 100µg) from 16/24h
 - Protein residues generally increase over time
 - Depending on detergent, analyzed visual result and protein

Other tests: Blood - Braunol





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- Significant increase over time, improvement with spray
- Values above 100µg: Belimed 72h: 3 Dr. Weigert: 16h: 1 24h: 4 72h: 2
- Visual: similar



Wet transport results



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- Clear improvement over dry and spray, plastic bag missing
- Best values with detergent immersion (disinfection?)
- Tissue: 1 value above 100 μg (72h)
- Significantly less visible soiling -72h



Corrosions



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- A high concentration of sodium chloride destroys the passivation layer in less than 1 hour (3,4,6), a high concentration of blood (1,2) in approx. 6h (longer than drying);
- Purisol and Browne Testsoil less corrosive
- Method needs to be improved / adapted



Summary of findings



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- Test soils vary greatly (corrosive / easy to rinse with water)
- Drying in 1-3 hours
 - Cleanability and corrosion also vary after
- Wet transport improves cleaning
 - Limited effects
 - Questionable corrosion
- Differences between protein and visual result
- 6h not a magic threshold
 => need for a differentiated recommendation

Lange Wartezeiten bis zur Aufbereitung, z. B. über Nacht oder über das Wochenende, sind wegen der Korrosionsgefahr und der Reinigbarkeit zu vermeiden. Erfahrungen zeigen, dass bei der Trockenentsorgung

in der Praxis Wartezeiten von bis zu 6 Stunden unproblematisch sind. Die Parameter Verschmutzung und Vorreinigung haben hierbei einen entscheidenden Einfluss.





Factors influencing the outcome of transport

Repeat

Inspectio

Accumulation

Long-term results

OR:

Type of soil test

Degree of soiling

Intermediate cleaning



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Objective of the process

- Clean instruments (different limit thresholds)
- No stains or corrosion (value / risk conservation)
- \Rightarrow Multiple influencing factors

No substantiated recommendation yet

No recommendation yet based on inferable evidence from tests

- Need to expand corrosion tests
- Cleaning: outliers?
- Evaluate handling

=> Clinical tests



Type of cleaning
 (immersion, wiping,...)
 Medium (water, NaCl,...)
 Chemicals

Cleaning at the point of use:

Transport

- Wet/Dry/...
 - Time
- Temperature, humidity



Manual pre-cleaning

- Type of cleaning
- (brush, ultrasonic,...)
- Medium (water, NaCl,...)
- Chemicals



Automatic cleaning

- Parameters
- Medium (water, NaCl,...)
- Chemicals (e.g. acid...)



What next?





Clinical test (1): Cleaning

- Method 1 (e.g. dry): mark soiled MD, test for protein residues after cleaning (without chemical disinfection)
- Alternative method (e.g. wet): same test for protein residues
- \Rightarrow Need a lot of MDs (diversity)
- \Rightarrow Only cleaning test (not corrosion)
- \Rightarrow If all values at 0µg: no meaning

Clinical test (2): stains / corrosion

- Assess condition of sets
- For 2-3 months
 - Re-cleaning protocol
 - Protocol repairs/replacements
- Reassess condition of sets
- Test different transport methods
 - Ideally similar soils
 - Easier with new MDs
 - Need large quanties (diversity)

Inspektionsliste			Datum/ von		
Set	Artikle Nr	Beschreibung	Herstell/ Rep Datum	Problem	Maßnahme

Interested?

2 WORLD STERILIZATION CONGRESS







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Thank you very much for your attention

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New!

Recommendations for the reprocessing