Recommendations by the Committee for Hygiene, Construction and Technology

Requirements for Construction or Reconstruction of a Reprocessing Unit for Medical Devices (RUMED)

Part 20: Recurring questions about compressed air in the RUMED

This Part replaces the Part 10 publication: Compressed air for re-processing medical devices

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Introduction

The Committee for Hygiene, Construction and Technology of the German Society of Sterile Supply (DGSV) e.V. described the basic requirements for the use of compressed air for reprocessing medical devices in its Part 10 publication in 2019.

In the RUMED, compressed air is used in the form of **TECHNICAL COMPRESSED AIR** for control of valves in sterilizers as well as of **MEDICAL COMPRESSED AIR** for drying medical devices.

In the **RUMED, COMPRESSED AIR IS USED IN THE FORM OF TECHNICAL COMPRESSED AIR** for control of valves in sterilizers or washer-disinfectors (WDs) as well as of **MEDICAL COMPRESSED AIR** for drying medical devices, such as tubes, hollow (lumened) devices or also endoscopes, intended for use in sterile or disinfected conditions.

To protect against RE-contamination of disinfected medical devices that are released for immediate use without being sterilized, the requirements for medical compressed air are therefore presented in the literature in accordance with the European Pharmacopoeia or the Pharmacopoeial Quality.

The **QUALITY OF MEDICAL COMPRESSED AIR** should be checked regularly.

This should be **CHECKED ANNUALLY** by the responsible hospital pharmacist or on their behalf. However, such an approach is not practical for RUMEDs at external sites or for service providers.

DIN EN 16422 stipulates, inter alia, that the "air quality be determined in terms of humidity, pressure, oil content, particle count, flow rate and measured at regular intervals".

Furthermore, the provisions of the German Central State Body for Health Protection with Regard to Drugs and Medical Devices (ZLS) or the certification requirements, e.g. as set out in DIN EN ISO 13485, specify that the RUMED monitor, measure and thus control the quality of its compressed air, with the result that **IMPLEMENTATION OF THESE PROVISIONS GIVES RISE TO RECURRING QUESTIONS** and debates because there are no homogeneous requirements.

IMPLEMENTATION of these provisions gives rise to **RECURRING QUESTIONS.**

Questions

Therefore, in an **EXTENSIVE SERIES OF TESTS** the members of the Committee for Hygiene, Construction and Technology as well as of the Scientific Board explored the question of at what intervals were **CLEANING, DISINFECTION OR ALSO STERILIZATION OF THE COMPRESSED AIR DISPENSING DEVICES** (compressed air pistol) required and **WHAT HAZARDS** could arise from medical compressed air or from compressed air of a substandard production quality. In addition, they wanted to know how the quality of the compressed air could be demonstrated in a RUMED with reasonable investment in day-to-day routine operations.

A **SERIES OF TESTS** was undertaken to explore the question of at what **INTERVALS WERE CLEANING, DISINFECTION OR ALSO STERILIZATION OF THE COMPRESSED AIR** dispensing devices (compressed air pistol) required and what **HAZARDS COULD ARISE** from compressed air.

In the course of the investigations another question arose, i.e. which culture or which nutrient media were most informative when it came to growing the samples and counting the results.

Experimental setup/sampling

Within the framework of the experimental setup, **THREE TEST SERIES**/methods were tested for sampling (list of materials at the end of this publication).

THREE TEST SERIES

- **Series 1:** Passage of compressed air through a filter connected via a Luer adapter to the compressed air pistol and subsequent closure with sterile Combi stoppers (Fig.1).
  - 3x pass compressed air through filter medium for 3 minutes on previously sterilized compressed air pistol at outlet 1 with maximum flow
  - 3x pass compressed air through filter medium for 3 minutes on previously sterilized compressed air pistol at outlet 2 with maximum flow
  - Pass compressed air through filter medium for 3 minutes on previously unsterilized compressed air pistol at outlet 3
  - 10. Filter medium as a control

- **Series 2:** Passage of compressed air through water for injection purposes (AMPUWA) by means of a sterile suction catheter like a waterfall (Fig.2).
  - Bottle 1 and 2: Flood with compressed air for 3 minutes at low flow on previously sterilized compressed air pistol
  - Bottle 3 and 4: Flood with compressed air for 3 minutes at low flow on previously unsterilized compressed air pistol from routine work operations
  - Bottle 5 as a control

- **Series 3:** Passage of compressed air through liquid in an air humidifier for oral/nasal oxygen therapy (Flowpak), also containing sterile water. High flow through 21 G cannula with ventilation cannula to discharge the air (Fig.3).
  - Flowpak 1: Flood with compressed air for 3 minutes at low flow on previously sterilized compressed air pistol
  - Flowpak 2: Flood with compressed air for 3 minutes at low flow on previously unsterilized compressed air pistol from routine work operations
  - Flowpak 3: as control

In the last two cases the liquid was filtered and the filter was cultured on an appropriate nutrient medium whereas in the first case the filter disc taken from the case/housing was incubated. In each case, the cultures were grown on Columbia agar, which is a commonly used complex nutrient medium (Fig.4).

Fig. 1

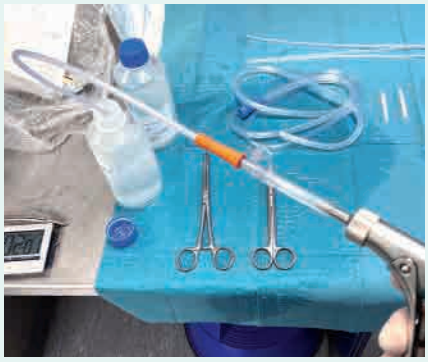

Fig. 2

Fig. 3

Fig. 4: Columbia agar plate with filter placed over it, above left: the front with filter placed over it and still without growth; above right: the back; below left: evidence of colony forming units (cfus) on the filter; below right: the back

Initial results

In the course of the first test series at Site A, method/series 3 proved to be impractical because passing the compressed air too quickly meant that too much air entered the liquid, causing widespread splashing or the liquid container was at risk of exploding. Despite using a ventilation cannula, it was difficult to control the air amount introduced and it was not possible to pass through the desired amount of air without "water damage". Besides, it was hard to withdraw the liquid from the container after sampling without causing contamination. The sampling results for the test series 1 to 3 are presented in Table 1.

Table 1: 07/02/2023 Site A, 3 methods

Evaluation: 06/02/2023/ 07/02/2023	Evidence of growth on Columbia agar (COL)			
Series 1: High flow filter medium				
		Sample 1: cfus/filter	Sample 2: cfus/filter	Sample 3: cfus/filter
	Pouch 1 3 x pass compressed air through filter medium for 3 minutes on previously sterilized compressed air pistol at outlet 1	0	0	0
	Pouch 2 3 x pass compressed air through filter medium for 3 minutes on previously sterilized compressed air pistol at outlet 2	0	1 *S. capitis*	0
	Pouch 3 3 x pass compressed air through filter medium for 3 minutes on previously unsterilized compressed air pistol at outlet 3	0	0	0
	Pouch 4 1x filter medium as a control	0		
Series 2: AMPUWA bottle 500 ml sterile, low flow				
			cfus/100 ml	
	Bottle 1: Flood with compressed air for 3 minutes at low flow on previously sterilized compressed air pistol		0	
	Bottle 2: Flood with compressed air for 3 minutes at low flow on previously sterilized compressed air pistol		0	
	Bottle 3: Flood with compressed air for 3 minutes at low flow on previously unsterilized compressed air pistol		0	
	Bottle 4: Flood with compressed air for 3 minutes at low flow on previously unsterilized compressed air pistol		0	
	Bottle 5: control		0	
Series 3: Flowpak 500 ml, sterile, high flow through 21 G cannula with ventilation cannula to discharge the air				
			cfus/100 ml	
	Flowpak 1: Flood with compressed air for 3 minutes at high flow on previously sterilized compressed air pistol		0	
	Flowpak 2: Flood with compressed air for 3 minutes at high flow on previously unsterilized compressed air pistol		0	
	Control		0	

The test results showed that none of the three sampling methods used gave rise to any relevant microbiology findings. The single case of microbial contamination is suggestive of contamination during sampling. As a consequence, the results, which had proved unexpected, were discussed in a joint meeting.

For verification purposes it was decided to take samples using methods 1 and 2 at two further sites.

Continuation of the test series and expansion of the measurement group

Using method/series 1, further series of tests with different setups were carried out in two other RUMEDs (sites B and C). The samples were each incubated on Columbia agar for 48 h at 37 °C.

Table 2: 24/09/2023 Site B, method 1 filter units

Control: 0 cfu			
Outlet 1 Sterile	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu
Outlet 2 Unsterile	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu
Outlet 3 Unsterile	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu

Table 3: 23/06/2023 Site C, method1 filter units

Control: 0 cfu			
Outlet 1 Sterile pistol Sterile gloves	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu
Outlet 2 Unsterile pistol Sterile gloves	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu
Outlet 3 Unsterile pistol Sterile gloves	Sample 1	Sample 2	Sample 3
	0 cfu	0 cfu	0 cfu

Following the first tests at a total of three sites, method/series 1 was not continued as a method because handling, sterilization and reprocessing of the filter inserts in the filter cartridge and connection proved to be too onerous for the routine work operations in the RUMEDs.

In addition, tests were conducted with method/ series 2. 2 x 100 ml aliquots of the rinsing solutions were filtered and then one filter was placed in each case on Columbia agar and on TSA agar and incubated at 37 °C for up to 48 h. The aim here was to establish whether the sampling method and choice of culture were informative. The following results were obtained:

Table 4: 24/09/2023 Site B, method 2 AMPUWA		
Sample 1: Sterile outlet	COL	0 cfu
	TSA	0 cfu
Sample 2: Unsterile outlet	COL	0 cfu
	TSA	0 cfu
Sample 3: Unsterile outlet	COL	0 cfu
	TSA	0 cfu
Sample 4: Blank sample	COL	0 cfu
	TSA	0 cfu

Table 5: 23/06/2023 Site C, method 2 filter units		
Sample E1: Sampling site E Sample 1 with sterile compressed air pistol – 3 min	COL	0 cfu
	TSA	0 cfu
Sample M2: Sampling site M Sample 2 with sterile compressed air pistol – 3 min	COL	0 cfu
	TSA	0 cfu
Sample E3: Sampling site E Sample 3 with unsterile compressed air pistol – 3 min	COL	*1 cfu Staphylococcus epidermidis*
	TSA	*3 cfus Staphylococcus epidermidis*
Sample M4: Sampling site M Sample 4 with unsterile compressed air pistol – 3 min	COL	0 cfu
	TSA	0 cfu
Sample K: Sample 5 with unsterile control sample – Original	COL	0 cfu
	TSA	0 cfu

Likewise, these test results showed that none of the sampling methods used led to any relevant microbiology findings. The single case of microbial contamination is suggestive of contamination during sampling.

Ensuring the effectiveness of the measurement method by simulating a worst-case scenario

To explore the question of whether the sampling method was sufficiently sensitive, it was decided to simulate a worst-case scenario, whereby a compressed air sample was to be taken from a demonstrably contaminated compressed air system.

This worst-case scenario was thus simulated on 21/04/2023 by taking compressed air from an agricultural workshop.

Table 6: 21/04/2023 Worst-case sampling		
Sample 1: Worst-case sample from the workshop at the stable	100 ml on COL	0 cfu
	100 ml on TSA	0 cfu
	100 ml on R2A	0 cfu

Similarly but surprisingly, the results obtained on using method 2 and simulating a worst-case scenario (compressed air sample from an agricultural workshop) did not show any microbiology findings.

Third test series for specification of the method

Following in-depth discussions in the study group and in order to explore the sensitivity of the culture methods and clarify a recovery rate, tubes were incubated with a biofilm and then flooded with compressed air so as to, in this way, gain insights into the recovery rate of microorganisms.

Sampling on 30/01/2024 at Site A

1 piece of tube with biofilm obtained from the University Hospital Bonn (UKB) around 10:00 h

Same day sampling

- Division of the unsterile tube into 4 sections with a sterile scissors
- CAUTION: The tube still contained liquid, hence this was in any event discharged into the sample
- Setup as previously:
  - Sterilized compressed air pistol with medical compressed air
  - Connected 28 Ch sterile tube with fingertip
  - Connected to this, orange 16 Ch suction catheter, separated in the middle
  - Inserted in the middle was the piece of tube with biofilm to be tested
  - Blasted for 90 seconds with compressed air in 500 ml sterile AMPUWA

Sample 1, 2 and 3 each taken from a piece of tube (Table 7)

Transport control biofilm: Control tube untreated in sterile vessel (Table 8)

Biofilm Tube 1, 2, 3: Three sampled pieces of tube following sampling in a sterile vessel (Table 8)

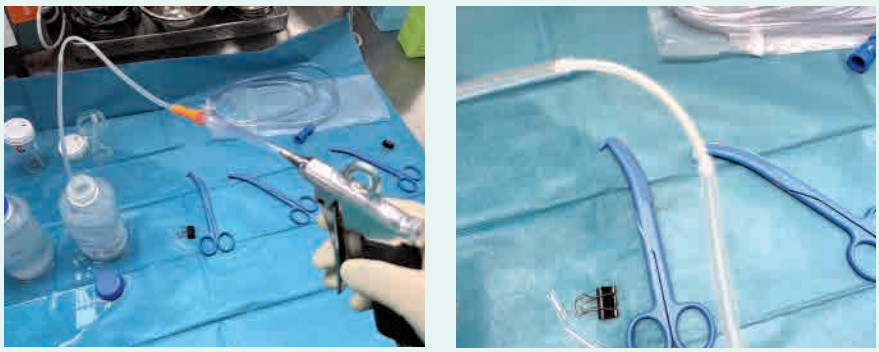

Fig. 5 a, b: Sampling the compressed air with an interposed, deliberately contaminated tube

Tests to determine the microbiological status of medical compressed air with deliberately contaminated materials

Sample obtained: 31/01/2024
Processing/filtration: on the same day
Evaluation: 02 to 05/02/2024 in the Disinfectant Testing Department at the Institute of Hygiene and Public Health (IHPH) at University Hospital Bonn (UKB)
Disinfectant Testing Department (DMT) No.: DMT 2024-007/008

In each case, 3 pieces of tube from the biofilm model of the Disinfectant Testing Department at the Institute of Hygiene and Public Health at UKB were sampled as follows:

- Sterilized compressed air pistol with medical compressed air
- Connected 28 Ch sterile tube with fingertip

- Connected to this, orange 16 Ch suction catheter, separated in the middle
- Inserted in the middle was the piece of tube with biofilm to be tested
- Blasted for 90 seconds with compressed air in 500 ml sterile AMPUWA.

1. Filtration of the samples from the bottle of AMPUWA rinsing solution 500 ml Plastipur

In each case, 3 x 100 ml of the rinsing solutions were filtered. Next, a filter was placed on TSA agar, on R2A agar and a further filter on Columbia agar and incubated at 37 °C (TSA and Columbia agar plates) and at 30 °C for the R2A agar plates. The TSA and Columbia agar plates were read after 48 h and the R2A agar plates were read after 5 days.

Table 7: Filtration and culture results on Columbia, TSA and R2A agar plates after 48 hours (Columbia/TSA) and after 5 days (R2A)

Sample 1	COL	0 cfu
	TSA	0 cfu
	R2A	122 cfus
Sample 2	COL	0 cfu
	TSA	0 cfu
	R2A	38 cfus
Sample 3	COL	0 cfu
	TSA	0 cfu
	R2A	97 cfus

2. Evaluation of the sampled pieces of tube from the biofilm model:

The three sampled pieces of tube as well as one unused transport control sample were analysed to determine the amount of residual biofilm. For each sample 0.5 ml of the biofilm extracted with 5 ml distilled water was plated out; for the transport control 0.5 ml of a 10^{-3} dilution was plated out. The samples were plated out onto TSA agar, R2A agar and Columbia agar. Incubation on TSA and Columbia agar plates took place at 37 °C, and on the R2A plates at 30 °C. The TSA and Columbia agar plates were evaluated after 48 hours and the R2A agar plates after 5 days.

Table 8: Recovery of microorganisms from the sampled biofilm tubes and transport control (TCO) after incubation on Columbia, TSA and R2A agar

		cfus/ml	cfus/tube
Biofilm tube 1	0.5 ml on COL	2	20
	0.5 ml on TSA	0	0
	0.5 ml on R2A	324	3,240
Biofilm tube 2	0.5 ml on COL	2	20
	0.5 ml on TSA	1	10
	0.5 ml on R2A	223	2,230
Biofilm tube 3	0.5 ml on COL	1	0
	0.5 ml on TSA	5	50
	0.5 ml on R2A	355	3,550
Transport control biofilm	0.5 ml on COL (Dil. 10^{-3})	1 cfus	1.0×10^4
	0.5 ml on TSA (Dil. 10^{-3})	0 cfu	0
	0.5 ml on R2A (Dil. 10^{-3})	27 cfus	2.7×10^5

The introduction of deliberate contamination by means of a biofilm-coated tube into the airflow system caused contamination of the sterile AMPUWA rinsing solution on blowing medical compressed air through it, in particular on the R2A agar. By contrast, the Columbia and TSA agar exhibited no, or only very minimal microbial contamination, pointing to greater sensitivity of the R2A agar for the biofilm-producing bacteria. This highlights the need to use several nutrient media to assure comprehensive microbiology analysis. Comparison of the transport control (TCO) on R2A (Table 8) with microbial recovery from the compressed air samples (Table 7) as well as from the tubes used for sampling showed a clear reduction in the recovery rate, which may be attributable to potential airflow stress on passage of the compressed air. Passage of compressed air through the biofilm-coated tubes led to a reduction in the total number of colony-forming units by 1.91 ± 0.12 $\log_{10}$ levels.

Fourth test round taking account of all nutrient media at three sites with method 2 (see Tables 9–11 on p. 331 ff.)

Based on the insights gained from the test series with deliberately contaminated tubes and the varying recovery rates (COL: 0%; TSA: 0% and R2A: 0.0007% to 0.002%) on the different nutrient media, and after more discussion in the group, a further test series was undertaken for sampling (medical) compressed air in three different institutions using method 2 described above (passage of compressed air through AMPUWA). In the interest of safety, it was aimed to take samples from the compressed air systems in the packing area of the RUMED as well as from places thought to be contaminated.

Testing the microbiological status of medical compressed air

Sample analysis method

In each case, 3 x 100 ml aliquots of the rinsing solutions were filtered under sterile conditions using 0.45 µm filter membranes. One filter was placed on TSA agar, one filter on R2A agar and a third filter on Columbia agar. The plates were incubated at 37 °C (TSA and Columbia) and at 30 °C (R2A). The TSA and Columbia agar plates were read after 48 hours and the R2A agar plates after 5 days. Furthermore, 10 ml of the AMPUWA solution was transferred to 40 ml brain heart infusion bouillon (BHI). Next, MALDI-TOF analysis was carried out at the Institute of Hygiene and Public Health, University Hospital Bonn, to differentiate the microorganisms detected.

The tests to determine the microbiological status of (medical) compressed air did not show any relevant microbiological contamination of the compressed air systems even when using a broad analysis spectrum involving various culture media. That applied to both sterile and unsterile conditions. However, sampling based on "Sample S – Condensate water trap, agricultural workshop" showed that the culture media used were able to demonstrate relevant contamination. The microorganisms detected are attributable to unintentional contamination due, in some cases, to an unsterile environment.

Conclusion

In summary, **NONE OF THE TESTS** resulted in any **SIGNIFICANT DIFFERENCE IN CONTAMINATION OF THE COMPRESSED AIR SYSTEMS**, which suggests that the few cases in which microorganisms were detected are attributable to contamination during the handling procedures. Microorganisms were detected only in an expected contaminated environment (agricultural workshop).

NONE OF THE TESTS resulted in any **SIGNIFICANT DIFFERENCE IN CONTAMINATION OF THE COMPRESSED AIR SYSTEMS**.

Hence, the following conclusions can be drawn:

1. Regular (automated) cleaning and disinfection of compressed air pistols in a RUMED appears advisable as a prevention measure. Therefore, when purchasing compressed air pistols or designing the systems, attention should be paid to ensuring that such devices and systems can be dismantled for cleaning and disinfection, are resistant to chemical and thermal influences and have suitable surfaces. Furthermore, installation of a line separator should be considered for technical and microbiological reasons when connecting to the medical compressed air for patient care.
2. However, the tests did not reveal any visible difference in contamination, or indeed no contamination was identified, between compressed air systems that had

been cleaned/disinfected and systems that had not been processed for a long time and had only undergone alcohol-based wipe disinfection as part of daily workplace-related environmental disinfection.

3. The sampling methodology can be deemed to be suitable. This is suitable both in terms of its feasibility, because in general all items needed are available in an operational healthcare facility, and in terms of the informative value of a sample taken and corresponding recovery of microorganisms.
   The sampling method, whereby the compressed air pistol is connected to a 28–30 Ch suction tube, a sterile fingertip and a suction catheter (orange 16 Ch catheter in the test), the sterile suction catheter is inserted into a bottle with 500 ml distilled water and compressed air is discharged for 3 minutes at moderate flow and then the bottle is closed and dispatched for sampling, can be described as proven and suitable.
4. Because of the differences in the growth behaviour of the various microorganisms, it is recommended to grow the samples obtained on TSA and Columbia agar as well as on R2A nutrient medium in order to get an informative picture. The sampling frequency should be based on the associated risks and determined at the discretion of the RUMED management or the infection control team.
5. Since the investment needed to produce medical compressed air is high and cost intensive due to system-specific features such as triple redundancy, among other things, by using compressed air of medical quality it may be possible to reduce production-related investments and thus save resources and costs. However, appropriate risk assessment and continuous quality control are important here.

References

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5. Anlage 8: Anforderungen an die Hygiene bei der Aufbereitung thermolabiler Endoskope [Annex 8 to the KRINKO/BfArM Recommendation: Hygiene requirements for the reprocessing of thermolabile endoscopes]
   (Mitgeltende Anlage der Empfehlung der KRINKO und des BfArM zu den „Anforderungen an die Hygiene bei der Aufbereitung von Medizinprodukten“. doi.org/10.1007/s00103-024-03942-1

Note from the authors:
This publication was prepared before the publication of the new Annex 8 of the KRINKO/BfArM Recommendation in October 2024. Annex 8 mentions both medical compressed air and compressed air of medical quality as a requirement and is therefore not clear in this respect.

Materials

- 500 ml AMPUWA rinsing solution (bottles with screw closure) - sterile -
- Orange 16 Ch suction catheter - sterile -
- 30 Ch suction tube, bidirectional funnel - sterile -
- Fingertip/suction interrupter conical on both sides - sterile -
- Small sterile cloth as underlay
- Sterile gloves
- Sterile scissors

Table 9: 18/08/2024 Site A, method 2 filter units

Sample designation/Sample origin	Analysis method	Result	Microorganisms identified
Sample N Blank sample	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample S Condensate water trap Agricultural workshop	100 ml on COL	2 cfus	*Corynebact. tuberculostearicum*
	100 ml on TSA	0 cfu	
	100 ml on R2A	Lawn-like growth	*Corynebact. tuberculostearicum*
	10 ml in bouillon	growth	*Corynebact. tuberculostearicum*
Sample 1 Agricultural workshop Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 2 Agricultural workshop Unsterile pistol	100 ml on COL	1 cfus	*Staphylococcus capitis*
	100 ml on TSA	0 cfu	
	100 ml on R2A	1 cfus	*Pseudomonas fluorescens*
	10 ml in bouillon	No growth	
Sample 3 RUMED Packing area Unsterile pistol	100 ml on COL	1 cfus	*Staphylococcus petrasii*
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 4 RUMED Packing area Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 5 RUMED Packing area Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 6 RUMED Decontamination area Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 7 ENDO-RUMED Decontamination area Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	

Table 9 continued

Sample designation/Sample origin	Analysis method	Result	Microorganisms identified
Sample 8 ENDO-RUMED Packing area Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 9 ENDO-RUMED Decontamination area Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	1 cfus	*Staphylococcus epidermidis*
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	

Table 10: 21/08./2024 Site B, method 2 filter units

Sample designation/Sample origin	Analysis method	Result	Microorganisms identified
Sample 1 Packing station 1 Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 2 Packing station 1 Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 3 Packing station 3 Unsterile pistol/no external wipe disinfection	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 4 Packing station 4 Unsterile pistol/external wipe disinfection	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 5 Hospital workshop Compressed air compressor None	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 6 Blank sample	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	

Table 11: 21/08/2024 Site C, method 2 filter units			
Sample designation/Sample origin	**Analysis method**	**Result**	**Microorganisms identified**
Sample 1 EWD 9/10 Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 2 Packing station, Naso Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 3 EWD 7/8 Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 4 Packing station, TEE Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 5 Packing station, Ophthalmology Sterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 6 Packing station, MIS Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 7 Packing station ENT Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	
Sample 6 Packing station Saw Unsterile pistol	100 ml on COL	0 cfu	
	100 ml on TSA	0 cfu	
	100 ml on R2A	0 cfu	
	10 ml in bouillon	No growth	

Abbreviations: END = Endoscope washer-disinfector, MIS = minimally invasive surgical (in-struments), ENT = Ear, nose and throat