

FEBRUARY 8, 2016



TOTAL BACTERIA COUNT TEST OF THE GLOVAC GLOVE SYSTEM AT GRUNDFOS

BACTERIOLOGICAL TEST
CARRIED OUT IN COLLABORATION WITH ISS FACILITY SERVICES A/S

ANNE-METTE KENLEY LINDORFF, JAN ERIK VEST HANSEN

GLOVAC APS

Palle Juul-Jensens Boulevard 82, DK-8200 Aarhus N

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Test conclusion

Based on the results in this report as well as interviews with cleaning assistants at Grundfos, we conclude the following;

- The GloVac system can be used without disinfectant for ordinary toilet cleaning.
- There is no indication that bacterial growth increases over days when using the same set of GloVac gloves for a longer period. Dry, cool and ventilated overnight storage of the gloves in the Vacuumizer ensures that the number of bacteria on the gloves drops to a low level before reuse the following day.
- When cleaning in critical areas where there are special requirements or increased risk of cross-contamination, the disinfectant "Diversey Soft Care Des E" can be used with advantage on the GloVac gloves before placing them in the Vacuumizer. Doing this will achieve better hygiene than using standard disposable gloves. The test show that even after prolonged storage in the Vacuumizer (approximately 20 hours), GloVac gloves which have been disinfected with "Diversey Soft Care Des E" before being placed in the Vacuumizer are still cleaner than normal disposable gloves.
- Enzyme-based detergents are – if viewed in isolation – not applicable as a disinfectant on the gloves since the organic material in the enzymes acts as "food" for the bacteria, thereby increasing bacterial growth. However, the enzyme-based cleaners can be used as disinfectants if the gloves are subsequently rinsed with cold water before being placed in the Vacuumizer. This will dramatically reduce the number of bacteria on the outside of the glove, and the GloVac gloves will be cleaner than a pair of standard disposable gloves. We can therefore conclude that it has a beneficial effect on the decrease in bacterial count to rinse the gloves after use, before placing them in the Vacuumizer.
- Disposable gloves may appear visually clean before and during use, but the test reveals that the gloves have almost as high bacterial count as contaminated gloves. This can be explained by the user being unable to avoid touching the outer surface of the glove when putting them on and taking them off.
- The test also shows that the GloVac system has a lower bacterial count than disposable gloves as the user never touches the outside of the glove during donning and doffing - and that ventilated and cool storage in the Vacuumizer unit also has a positive effect on decreasing the bacterial count.
- If you use the GloVac system in combination with the "Diversey Soft Care Des E" disinfectant, you can achieve a hygienic standard that is at least as good - or better - than by using disposable gloves. This will allow for future use of the GloVac system when cleaning in critical areas such as:
 - Level 1-3 in hospitals
 - Laboratories
 - When handling foodstuffs

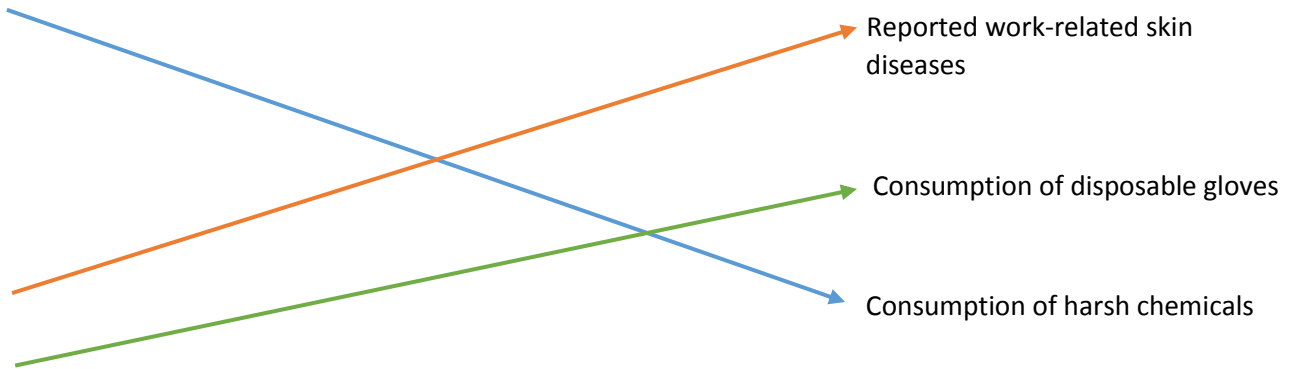
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

- Bacterial count test inside the GloVac gloves show that the number of bacteria inside the gloves does not rise to a critical level during the working day. And the ventilated overnight storage in the Vacuumizer caused a clear decrease in the bacterial count. We can thus conclude that there will not be an increased risk for the cleaning assistants to use the same GloVac gloves continuously for a week as the bacterial number does not reach critical levels inside the gloves.
- Disinfecting the hands before putting on gloves does not make a noticeable difference on the bacterial count inside the gloves. But the longer the gloves hang ventilated in the Vacuumizer the more the bacterial count inside the gloves will decrease. In addition, the hands will dry when they are out of the gloves, which in turn reduces the bacterial count on the hands - and thus also the bacterial count inside the gloves. This emphasizes the importance of using only gloves when necessary and otherwise having the hands out in the open air as often as possible.
- User interviews show that the cleaning assistants express the need for a thinner glove type to achieve increased feelings with things but at the same time has a flocked inside for increased comfort. The shaft of the gloves may be shortened to cover a smaller part of the forearm. The users pointed out that it took time for them to move around the cleaning trolley to take the gloves on and off in the Vacuumizer. However, this must be compared against the time it takes to put on and take off a pair of standard disposable gloves. We estimate that this will not be time-consuming as soon as the cleaning assistants receive instruction in the use of the system and build up a daily work routine with the GloVac system.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Summary

Despite the serious efforts of ISS and other cleaning companies to improve the skin safety of employees through increased purchasing / consumption of gloves and increased use of enzyme-based / mild cleaning products, figures from the Danish Labour Market Insurance (AES) show an ever-increasing number of reported and approved compensations due to work-related skin diseases:



The test gives an explanation for this paradox (shown in the figure above) as we find that wearing disposable gloves unfortunately pushes the behavioral pattern in a direction where the overall glove-wearing time becomes unintentionally high, thus increasing the risk of especially skin disorders due to heat and moisture inside the gloves.

The test also shows that the GloVac system can change this behavior so that the application time can be reduced dramatically. This - in combination with a higher quality glove and storage method when the glove is not in use - will significantly increase the skin safety for the employees.

Furthermore, the test demonstrated that the GloVac system, as compared to disposable gloves, allows for reduction of the risk of cross-contamination in critical cleaning areas where there are particularly high standards of hygiene, if an external disinfection of the glove between the work areas is conducted.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Table of Contents

Test conclusion	1
Summary	3
Purpose	5
Method and test purpose	5
Field tests at Grundfos.....	5
Laboratory tests.....	6
Test-materials og test-units used	8
Test results	9
Field tests.....	9
Laboratory tests.....	10
Final interview with cleaning assistants at Grundfos Tuesday February 2, 2016	15
Appendix 1:.....	16
Appendix 2:.....	17
Appendix 3:.....	20
Appendix 4:.....	25
Appendix 5:.....	30
Appendix 6:.....	31
Appendix 7:.....	36
Appendix 8:.....	40
Appendix 9:.....	41
Appendix 10:.....	45

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Purpose

The purpose of performing a bacteria count test on cleaning trollies with fitted GloVac glove systems is to identify the risk of cross-contamination between areas in the workplace with particular focus on toilet cleaning.

It is investigated whether it is necessary to use disinfectant to prevent cross-contamination (focusing on the gloves for toilet cleaning). In addition, a test of the ability to use an enzyme-based cleaner (BioScrub / Klean All) for disinfecting gloves is conducted.

A laboratory test of both clean and contaminated GloVac gloves with the use of alcohol based "Diversey Soft Care Des E" disinfectant will conclude if the use of "Diversey Soft Care Des E" is more effective or less effective than enzyme-based cleaner as disinfectant.

As a reference, bacteria count test on 1 set of clean and 1 set of contaminated standard nitrile disposable gloves is performed.

In addition, the bacteria count inside the gloves is examined using a laboratory test, which determines whether the bacteria count after one day of continuous use is kept at an acceptable low level. It is also investigated whether the disinfected hands have a beneficial effect on the bacteria count inside the gloves

The GloVac glove system is designed to reduce the total glove wearing time for the individual cleaning assistant during a work day while offering cleaning assistants better glove quality - which reduces moisture genes inside the glove and has a higher barrier property - and thus preventively reduce the risk of eczema / allergies for the cleaning assistants. This is investigated by user interviews.

Method and test purpose

Field tests at Grundfos

The GloVac glove system was mounted on 3 cleaning trollies at Grundfos in Bjerringbro (Jutland, Denmark). In order to get as broad-spectrum results as possible, different things were tested on the 3 trollies:

Trolley 1: Tests conducted on red gloves (toilet areas) without the use of a disinfectant. *(see appendix 3 for test results)*

Trolley 2: Tests conducted on red gloves (toilet areas) using enzyme-based cleaner (BioScrub 5%) as a disinfectant. *(see appendix 4 for test results)*

Trolley 3: Tests conducted on blue gloves (regular cleaning) without using a disinfectant. *(see appendix 5 for test results)*

The user of trolley no. 3 also suffers from eczema on her hands, which forces her to use textile gloves under her regular disposable gloves while she uses the cleaning trolley (about 5 hours each working day) and when she uses other trollies (about 2 hours per day). During this test, she would not use textile gloves when she used the GloVac glove system. She would therefore continually make a subjective visual examination of her hands to assess whether she can do without using textile gloves when using GloVac glove system. At the slightest indication that her skin eczema was worsened, she would immediately start using the textile gloves again.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

For trollies 1 and 2, the purpose is: Evaluation of the bacteria count on the outside of a GloVac glove during respectively one working day and one working week when no disinfectant is used (trolley 1) and when enzyme-based cleaner (BioScrub 5%) is used as a disinfectant (trolley 2).

For trollies 1 and 2, the test is as follows: A bacteria-swipe made on the clean glove before the first toilet cleaning is started. Hereafter a new swipe is taken before the gloves are used for toilet cleaning no. 2, no. 3 and no. 4.

For trolley 3 the purpose is: To test the development of the bacteria count for regular office cleaning on a set of GloVac gloves without disinfectant during respectively a working day and a working week. In addition, testing if the GloVac glove system can help improve skin health for an employee suffering from eczema on the hands.

For trolley 3, the test is as follows: The cleaning assistant takes one daily bacteria-swipe each morning before regular office cleaning is commenced.

The involved cleaning assistants were introduced to the use of GloVac glove system on Thursday January 7th 2016, and received extensive oral and written instruction on how a bacteria-swipe is done on Monday, January 11th 2016, after which the test ran from Monday 11th through Friday 15th of January 2016.

(See appendix 1, p. 14, for instructions on bacteria-swipe sampling).

Laboratory tests

In parallel with the field-tests at Grundfos we supplemented with various laboratory tests, to support and elaborate the results obtained by the above-mentioned field-tests at Grundfos. In addition, more questions were raised from staff which we would investigate and find answers to by carrying out laboratory tests.

Laboratory Test 1: We conducted a laboratory test of clean and contaminated GloVac gloves using existing alcohol-based disinfectant "Diversey Soft Care Des E".

Purpose of the test: Clarification of the efficiency and speed of "Diversey Soft Care Des E" disinfectant when applied to the outside of the GloVac gloves.

The test is as follows: A bacteria count test was performed on the outside of the GloVac glove before contamination, after contamination, immediately after disinfection with "Diversey Soft Care Des E", and after 1, 2, 3, 4 and 5 minutes after disinfection, where the gloves have been ventilated in the Vacuumizer. A final bacteria count test was performed the following day (about 20 hours after disinfection with "Diversey Soft Care Des E") where the gloves had been sitting in the Vacuumizer overnight.

(see appendix 6 for test results)

Laboratory test 2: The two enzyme-based cleaning products "Klean All" (0.1% and 0.5% respectively) and "Bioscrub" (1% and 5% respectively) which are used at Grundfos were tested to clarify if these could be used as a disinfectant.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Purpose of the test: Clarification of the effectiveness of different solutions of the enzyme-based disinfectants "Klean All" (0.1% and 0.5% respectively) and "Bioscrub" (1% and 5% respectively) as a disinfectant for gloves.

The test is as follows: A bacteria count test was taken on a pair of GloVac gloves before contamination and after contamination. Klean All was applied (0.1% or 0.5%, respectively) or "Bioscrub" (1% or 5% respectively), after which a bacteria count test was repeated on the gloves to check if the bacteria count had decreased.

(see appendix 7 for test results)

Laboratory test 3: As a reference, we conducted a bacteria count test of a set of standard nitrile disposable gloves before and after contamination during toilet cleaning.

Purpose of the test: To determine the amount of bacterial accumulation on a set of standard nitrile disposable gloves, so that this can be used as a reference to the GloVac glove tests.

The test is as follows: A bacteria count test performed on a few standard disposable nitrile gloves after being put on the hands before contamination and after contamination.

(see appendix 8 for test results)

Laboratory Test 4: A pair of clean GloVac gloves were used 6 times for 10 minutes during a working day with approx. 10 minutes between each use. Bacteria count test was made of the glove's inside between each use, as well as a final swipe after overnight storage of the glove in a Vacuumizer.

Purpose of the test: To test the development of the bacteria count inside the GloVac gloves during a working day, as well as the effect of ventilated overnight storage of gloves in the Vacuumizer.

The test is as follows: Before use, bacteria count tests were carried out on the inside of the glove and on the (unwashed) hand before it was put into the glove. The glove is used for 10 minutes and then placed in the Vacuumizer for 10 minutes. Then a new bacteria count test of the inside of the glove is conducted before each donning, as well as a final bacteria count test of the inside of the glove after having been stored in the Vacuumizer overnight.

(see appendix 9 for test results)

Laboratory Test 5: A bacteria count test is made on the inside of the GloVac gloves after a user has used the gloves for 10 minutes with hands which have been disinfected with existing alcohol-based disinfectant "Diversey Soft Care Des E".

Purpose of the test: This test is performed to test whether the disinfectant applied to the hand has a beneficial effect on the bacteria count inside the glove.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

The test is as follows: The gloves are used for 10 minutes with un-disinfected hands. Afterwards, the hands are disinfected with existing alcohol-based disinfectant "Diversey Soft Care Des E", after which the user again uses the gloves for 10 minutes. The gloves are tested on the inside twice: immediately after use and 10 minutes after the gloves have been used and put in the Vacuumizer.

(see appendix 9 for test results)

Laboratory test 6: The outside of the glove is tested after contamination and after disinfection with BioScrub 5%, after which the glove is rinsed clean with cold water before being placed in the Vacuumizer.

Purpose of the test: To simulate that the glove has been used with BioScrub 5% and subsequently rinsed clean before insertion into the Vacuumizer. This is done to clarify whether the bacteria count on the outside of the glove is reduced by rinsing the glove in cold water before placing it in the Vacuumizer.

As a reference, the test is also carried out with a glove *without* previous disinfection with BioScrub 5%.

The test is as follows: A GloVac glove is contaminated, after 30 minutes in the Vacuumizer a bacteria count test is performed. The BioScrub 5% is applied to the outside of the glove and then rinsed in cold water and placed in the Vacuumizer for 30 minutes. Then another bacteria count test is conducted on the glove.

The same test is performed again, but this time without the use of BioScrub 5%.

(see appendix 10 for test results)

Test-materials og test-units used

3M™ Petrifilm™ swab -samplers with 1ml Lethéen bouillon, and 3M™ Petrifilm™ count plates for total bacteria count are used for the tests.



Figure 1: 3M Petrifilm swab-samplers



Figure 2: 3M Petrifilm for total bacteria count

Sampling is done by removing the swab-sampler from the test tube with liquid and stroking the desired area. Then the swab is reinserted in the test tube with liquid. Subsequently, the liquid in the test tube is poured onto the Petrifilm, which is then placed in a heating cabinet at 30 ° for 48 hours so that the bacterial flora can develop.

Then a visual count of the bacterial colonies on the Petri film is made. *(Reference: see appendix 2).*

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Test results

The following results were:

Field tests

Trolley 1: Toilet cleaning *without* use of disinfectant (see appendix 3).

The test was as follows: A bacteria swipe is taken on the clean glove before toilet cleaning no. 1 was started. Then a new swipe is made before the gloves are used for toilet cleaning no. 2, no. 3 and no. 4.

Result: The bacteria count from 1st swipe (clean glove) to 4th swipe was increased by approx. factor 50. However, the bacteria count in swipe 4 (where there is the highest bacterial density) is still within the acceptable limit for toilet cleaning according to 3M's supplier.

It is also noted that the bacteria count on the following day by swipe 1 has dropped significantly so that it is noticeably lower, even though there has been no disinfection / cleaning of the glove, but it has merely been ventilated in the Vacuumizer overnight. This pattern is clearly seen over all 5 days. In addition, no noticeable increase in the bacteria count over the week is observed when looking at swipe 4 (where there is the highest bacterial density) for all days, which shows that there is no increase of bacteria on the outside of the glove when using the same glove continuously for a week.



Figure 3: Swipe 1, day 1

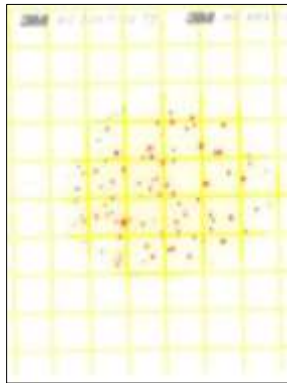


Figure 4: Swipe 4, day 1

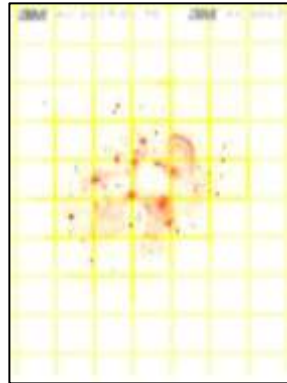


Figure 5: Swipe 1, day 5

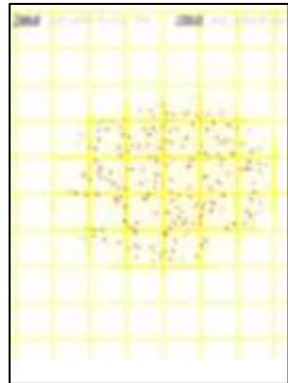


Figure 6: Swipe 4, day 5

Trolley 2: Toilet cleaning *with* enzyme-based cleaning agent (BioScrub 5%) as disinfectant (see appendix 4).

The test was as follows: A bacteria swipe is taken on the clean glove before toilet cleaning no. 1 was started. Then a new swipe is made before the gloves are used for toilet cleaning no. 2, no. 3 and no. 4.

Result: The bacteria count increase from swipe 1 (clean glove) to swipe 2 is very clear - so high bacterial density comes that a "cloud" of bacteria occurs on the bacteria count test, which remains there for the rest of the day. The same result is clearly seen for all days.

However, a clear minimization of the bacteria count is again seen when the glove is ventilated in the Vacuumizer overnight. Thus, for all days, swipe 1 has clearly the lowest bacteria count. The bacteria count

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

in swipe 1 for all days is almost the same, and this shows that the number of bacteria is not increased by continuous use of the same glove in the GloVac glove system for one week.

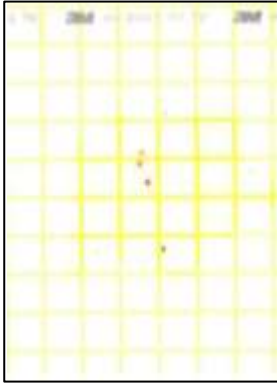
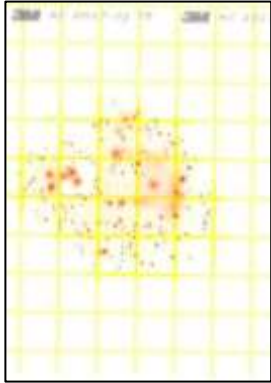


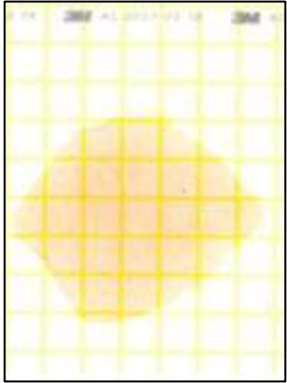
Figure 7: Swipe 1, day 1



Figur 8: Swipe 2, day 1



Figur 9: Swipe 1, day 3



Figur 10: Swipe 2, day 3

Trolley 3: Ordinary cleaning without the use of disinfectant (see appendix 5).

The test was as follows: The cleaning assistant took one daily bacteria swipe on the glove each morning before cleaning began.

Result: A slight increase in the bacteria count from swipe 1 (first day) to swipe 5 (last day) can be seen, but the result is within the acceptable limit for ordinary cleaning according to 3M's supplier.



Figure 11: Day 1



Figure 12: Day 5

Laboratory tests

Laboratory test 1: Test with the alcohol-based disinfectant "Diversey Soft Care Des E" (see appendix 6).

The test was as follows: Bacteria count tests of the outer side of the GloVac glove were conducted before contamination, after contamination, directly after disinfection with "Diversey Soft Care Des E", and after 1, 2, 3, 4 and 5 minutes after disinfection, where the gloves have been ventilated in the Vacuumizer. A final

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

bacteria count test was conducted the following day (about 20 hours after disinfection with "Diversey Soft Care Des E"), where the gloves had been sitting in the Vacuumizer overnight.

Result: The test shows that the alcohol-based disinfectant works effectively on the bacteria count on the gloves. Already after approx. 3 minutes in the Vacuumizer, the gloves are cleaner than when they were newly packed / clean (see swipe 1).

The bacteria count on the gloves after one night in the Vacuumizer is also virtually non-existent, and significantly less than when the gloves were newly packed / clean.

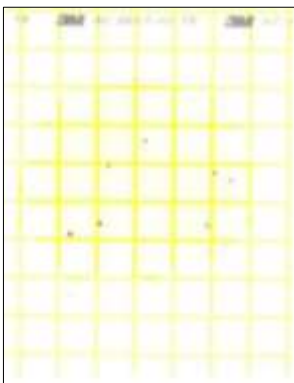


Figure 13: Clean glove

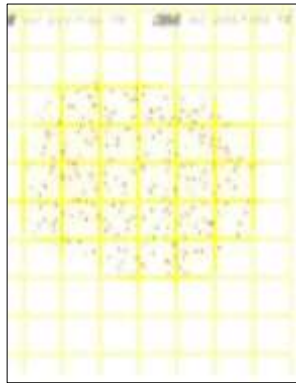


Figure 14: Contaminated glove

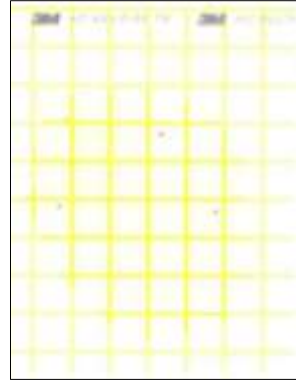


Figure 15: Disinfected glove after 3 minutes in Vacuumizer

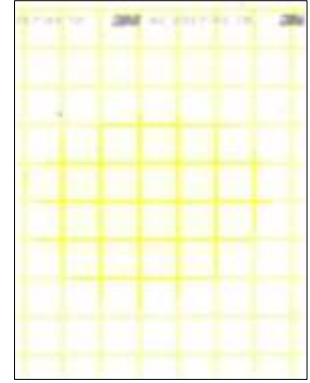


Figure 16: Disinfected glove after approx. 20 hours in Vacuumizer

Laboratory Test 2: Test of enzyme-based cleaning agent BioScrub (resp. 1% and 5% solution) and Kleen All (resp. 0.1% and 0.5% solution) as a disinfectant (see appendix 7).

The test was as follows: Bacteria count test was conducted on a pair of GloVac gloves before contamination and after contamination. "Kleen All" (resp. 0.1% or 0.5%) or "Bioscrub" (resp. 1% or 5%) was applied, with subsequent bacteria count testing.

Result: The test results show that the bacteria count on the gloves after disinfection with the enzyme-based cleaners is NOT diminished - on the contrary, an increase is detected in some cases.

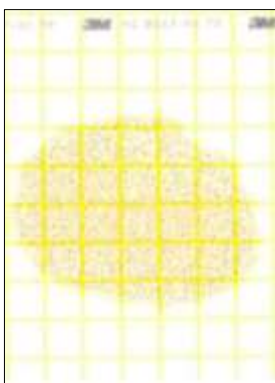


Figure 17: Contaminated glove



Figure 18: Glove disinfected with BioScrub 5%

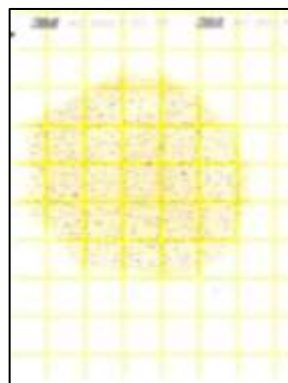


Figure 19: Contaminated glove

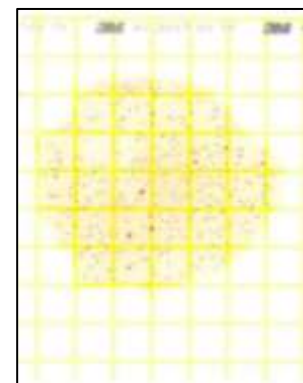


Figure 20: Glove disinfected with Kleen All 0,5%

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Laboratory test 3: Bacteria count test of standard nitrile disposable gloves (see appendix 8).

The test was as follows: Bacteria count test was conducted on a pair of standard disposable nitrile gloves when they have been put on the hands before contamination and after contamination.

Result: Bacteria count on the disposable gloves before and after contamination remains unchanged, as the disposable gloves have a high bacterial density already after they have been put on and before contamination (the outer side of the gloves have been touched during donning).

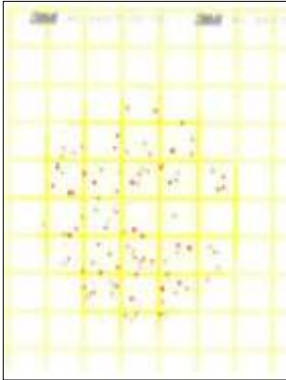


Figure 21: Clean Nitrile disposable glove after donning.

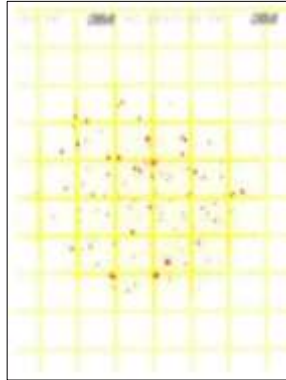


Figure 22: Contaminated nitrile disposable glove.

Laboratory Test 4: Testing the inside of GloVac gloves without using a disinfectant (see appendix 9).

The test was as follows: Bacteria count test of both hand and of glove inside before 1st use. Then a bacteria count test is conducted on the inner side of the gloves before each donning (6 times in total), and a final bacteria count test of the inner side of the gloves after the gloves have been stored in the Vacuumizer overnight.

Results: The test results showed that the bacteria count on the inside of the glove increased slightly at the start of the test, but then stabilized at a level that was not much higher than the bacteria count of an uninfected hand. In addition, the bacteria count dropped significantly inside the glove when stored in the Vacuumizer overnight. The bacteria count did not reach a critical level at any time



Figure 23: Unwashed hand



Figure 24: 3. swipe inside glove



Figure 25: 6. swipe inside glove

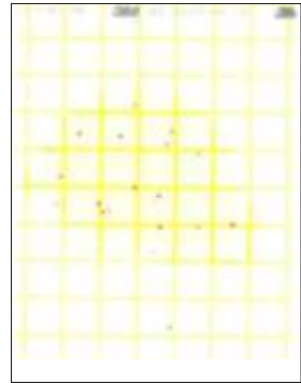


Figure 26: swipe inside glove after storage in Vacuumizer overnight.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Laboratory Test 5: Testing the inside of GloVac gloves when using the "Diversey Soft Care Des E" disinfectant on the hands (*see appendix 9*).

The test was as follows: The glove is used for 10 minutes with un-disinfected hands. Then the hands are disinfected with the "Diversey Soft Care Des E" disinfectant and the gloves are used again for 10 minutes. The gloves are then tested on the inside immediately after they are taken off and put in the Vacuumizer and again 10 minutes after storage in the Vacuumizer.

Result: There was no noticeable difference in bacteria count inside the glove before and after using the glove with disinfected hands. Thus, it will not make any noticeable difference in the bacteria count to disinfect the hands before the gloves are used.



Figure 22: Bacteria count inside the glove after 10 min. use with disinfected hand.

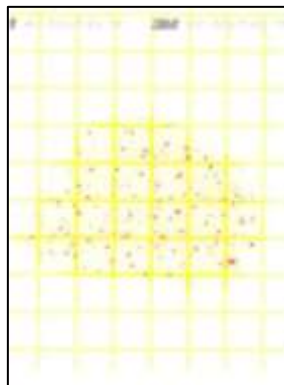


Figure 28: Bacteria count inside the glove 10 min. after 10. min use with disinfected hand.

Laboratory test 6: Testing the outside of the glove after contamination and disinfection with BioScrub 5% where the glove is subsequently rinsed clean with cold water before placing it in the Vacuumizer (*see appendix 10*).

The test was as follows: A GloVac glove is contaminated and after 30 minutes storage in the Vacuumizer a bacteria count test is performed. The glove is applied BioScrub 5% and then rinsed in cold water and placed in the Vacuumizer for another 30 minutes. Then another bacteria count test is carried out on the outer side of the glove.

The same test is performed again, but now without the use of BioScrub 5%.

Result: The bacteria count test showed that if the gloves are rinsed with water before storage in the Vacuumizer unit, the bacteria count will drop drastically to a level that is the same as or even better than a clean glove. With prior disinfection with BioScrub 5% and subsequent flushing with cold water, the bacteria count was even lower.

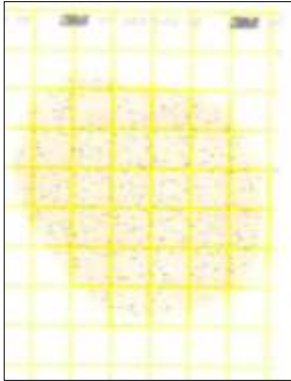


Figure 29: Contaminated glove (after 30 minutes)

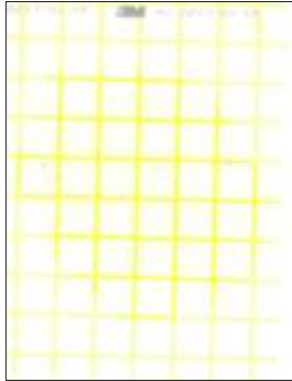


Figure 3: Gloved rinsed with cold water and stored in Vacuumizer for 30 minutes.

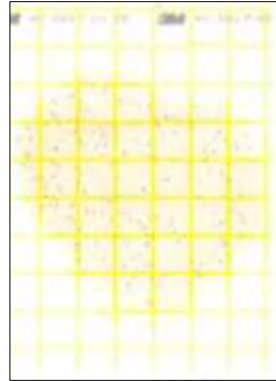


Figure 31: Contaminated glove (after 30 minutes)

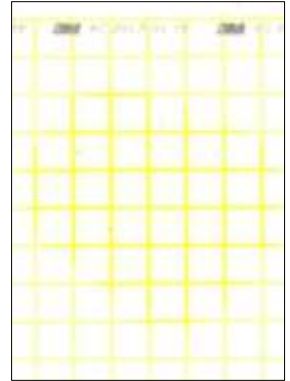


Figure 32: Glove disinfected with BioScrub 5% and rinsed with cold water and stored in Vacuumizer for 30 minutes

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

[Final interview with cleaning assistants at Grundfos Tuesday February 2, 2016](#)

The responsible employee from ISS was presented with the results of the tests with BioScrub and Klean All, which showed greatly increased bacteria counts when using these products for disinfecting the gloves. Similarly, the results of toilet cleaning without the use of disinfectant showed lower bacteria counts. It was discussed whether it would improve the result if the cleaning assistant rinsed the gloves in cold water before storing them in the Vacuumizers between toilet cleanings. It was agreed that GloVac will carry out laboratory tests to clarify this.

2 of the 3 cleaning assistants who used the GloVac system participated in the meeting and gave feedback on the use of the system.

Generally, the cleaning assistants would prefer gloves that are slightly thinner than the blue latex gloves used during the tests. They wish to have a better feel for things through the gloves when they clean. However, they still want the flocking inside the gloves to increase comfort during use.

The cleaning assistants were presented with various glove types and thicknesses for testing, and they chose a thin, blue nitrile glove without a flocked inner side, as this glove thickness was thinner than the existing blue GloVac gloves. However, they would like to have the glove even thinner if this was possible, as well as a flocked inside.

One of the cleaning assistants described that she sometimes had a little trouble getting the glove off her hand in the Vacuumizer if she had been wearing the glove for a long time, so her hand had become slightly damp. She also pointed out that she felt she spent time having to walk around the trolley to get to the Vacuumizer units for putting on and taking off the gloves during the day.

The possibility of mounting the system on existing "Box trollies" was discussed. Mounting the system at the end of the carriage seemed to be the most plausible solution, so it disturbs as little as possible when the cleaning assistants use the trollies. However, it will require special fittings and development of these. It was agreed that GloVac can borrow a "Box trolley" for mounting tests of the GloVac system if this becomes applicable.

It was discussed whether it was possible to make the gloves with a slightly shorter shaft, as the cleaning assistants feel that the shaft of the glove is a little too long. They want gloves that have a shaft length that stops exactly in "wristwatch-length" so that the glove covers a possible wristwatch, but not the entire forearm.

There is great interest in how bacteria testing of the inside of the gloves will be, as this especially has the focus of the cleaning assistants (is it hygienic to use the same gloves for a week - does it damage the skin on my hands?).

During the test a cleaning assistant with hand eczema (who therefore needed to use thin textile gloves under the disposable gloves) would try to use only the GloVac gloves without textile gloves underneath.

This was tried, but after the first day, the cleaning assistant had to put on the textile gloves again. However, it was difficult to assess whether this was due to the GloVac system being unable to resolve the problem or whether it was because the assistant only used the GloVac system half of her working day and the other half of the day used disposable gloves.

There is generally a great interest and cooperation about the project, and we receive very constructive feedback on the task.

Appendix 1:

How to take swipe on the glove's grip surface:

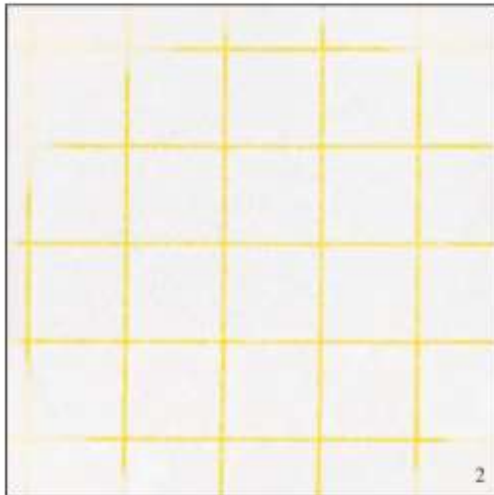
1. A sample is taken after donning the gloves. This is done **4 times** each day.
2. There are 4 containers with lids / swab for a day's use.
3. The containers are **numbered from 1 to 4** corresponding to the sequence of sampling.
4. The sample is taken on the inside of the hand that the user uses the most - usually the right hand and otherwise the left hand.
5. The swab is stroked once over each finger (not thumb) from finger root to fingertip (see arrows).



6. Place the swab back in the container again and screw it in to prevent leakage.
7. The containers are stored for collection when **4 glove changes** have been made.

Appendix 2:

3M™ Petrifilm™ Aerobic Count Plate

**Count = 0**

It is easy to interpret the Petrifilm Aerobic count plate. Figure 2 shows a Petrifilm Aerobic count plate without colonies.

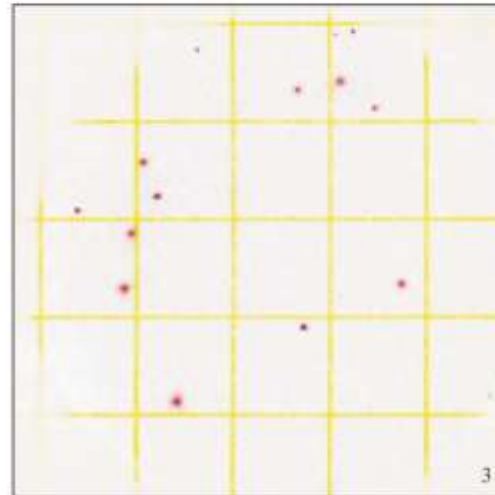
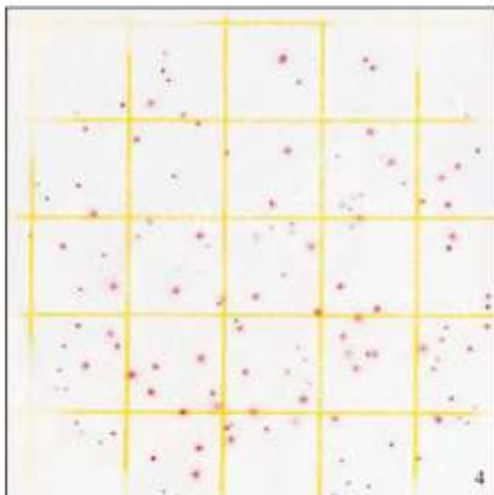
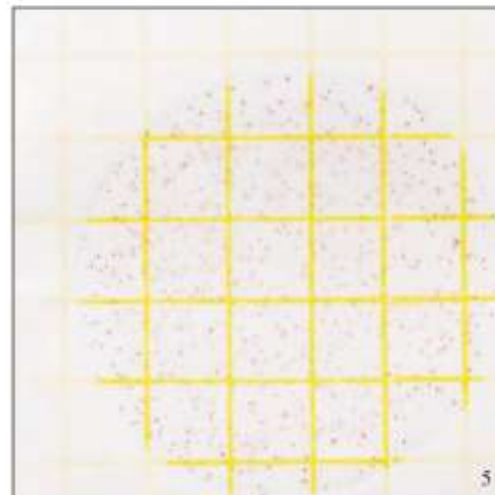
**Count = 16**

Figure 3 shows a Petrifilm Aerobic count plate with a few bacterial colonies. A red indicator dye in the plate colours the colonies. Count all red colonies regardless of sizes or colour intensities. Use a standard Quebec-type counter to read the Petrifilm plate.

**Count = 143**

As with an agar pour plate, the preferable counting range on a Petrifilm Aerobic count plate is 10-300 colonies. See figure 4.

**Estimated count = 420**

When colonies number more than 300 as in figure 5, estimate the count. Determine the average number of colonies in one square (1 cm²) and multiply it by 20 to obtain the total count per plate. The inoculated area on a Petrifilm Aerobic count plate is approximately 20 cm².

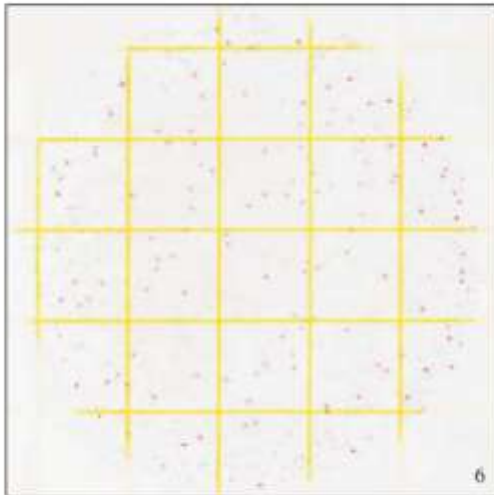
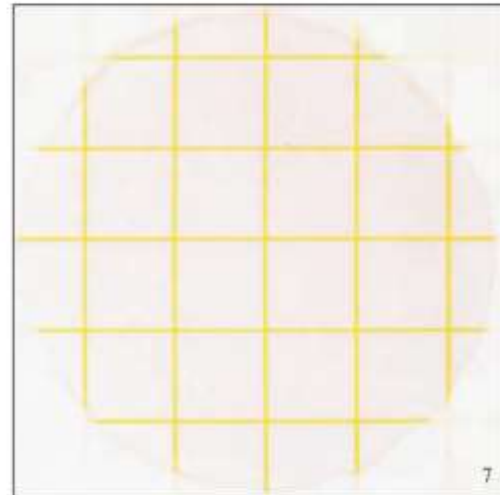
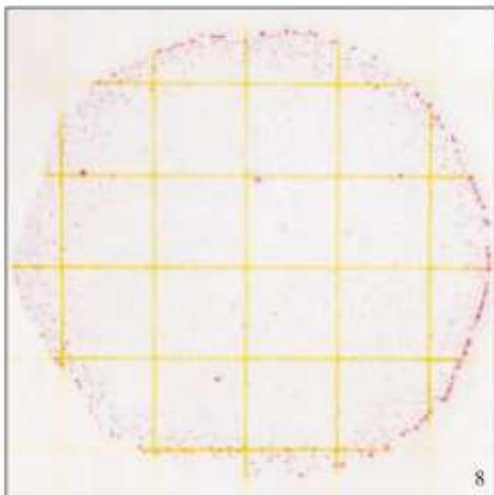
**Count = TNTC**

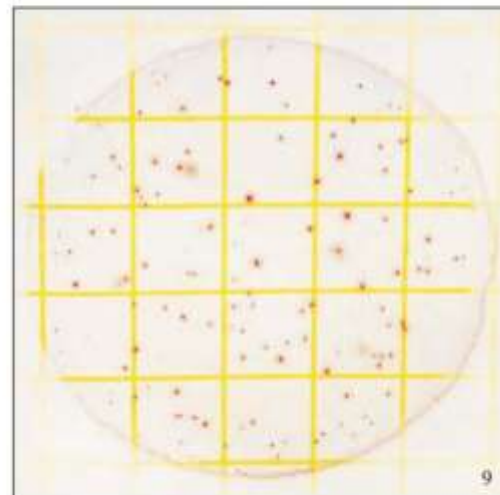
Figure 6 shows a Petrifilm Aerobic count plate with colonies that are too numerous to count (TNTC).

**Count = TNTC**

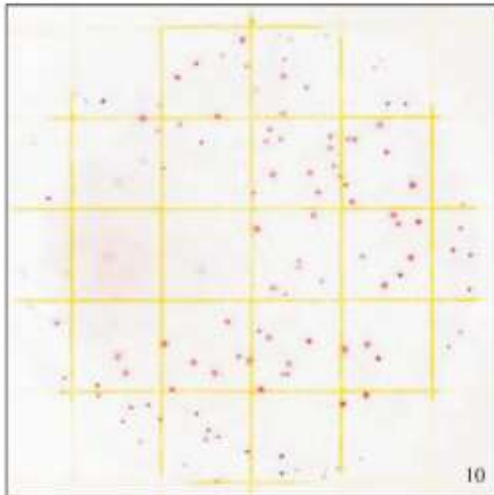
With very high counts, the entire growth area may turn pink, as shown in figure 7. You might observe individual colonies only at the edge of the growth area. Record this as a TNTC result.

**Count = TNTC**

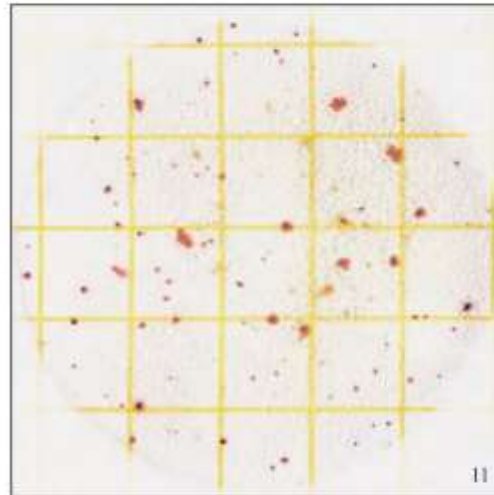
Occasionally, distribution of colonies appears uneven as shown in figure 8. This is also an indication of a TNTC result. In fact, the distribution is even.

**Count = TNTC**

The colonies on the Petrifilm Aerobic count plate in figure 9 appear countable at first glance. However, when you look closely at the edges of the growth area, you can see a high concentration of colonies. Record this as a TNTC result. See figure 9.

**Estimated count = 160**

A few species of bacteria liquify the gel in the Petrifilm Aerobic count plate, as shown in figure 10. When this occurs, determine the average count in a few unaffected squares and then estimate the total count. Do not count red spots within the liquified area.

**Count = 83**

Colonies on Petrifilm Aerobic count plates are red and can be easily distinguished from opaque food particles that may cause confusion with agar pour plates. See figure 11.

GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Appendix 3:

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

Without use of disinfection

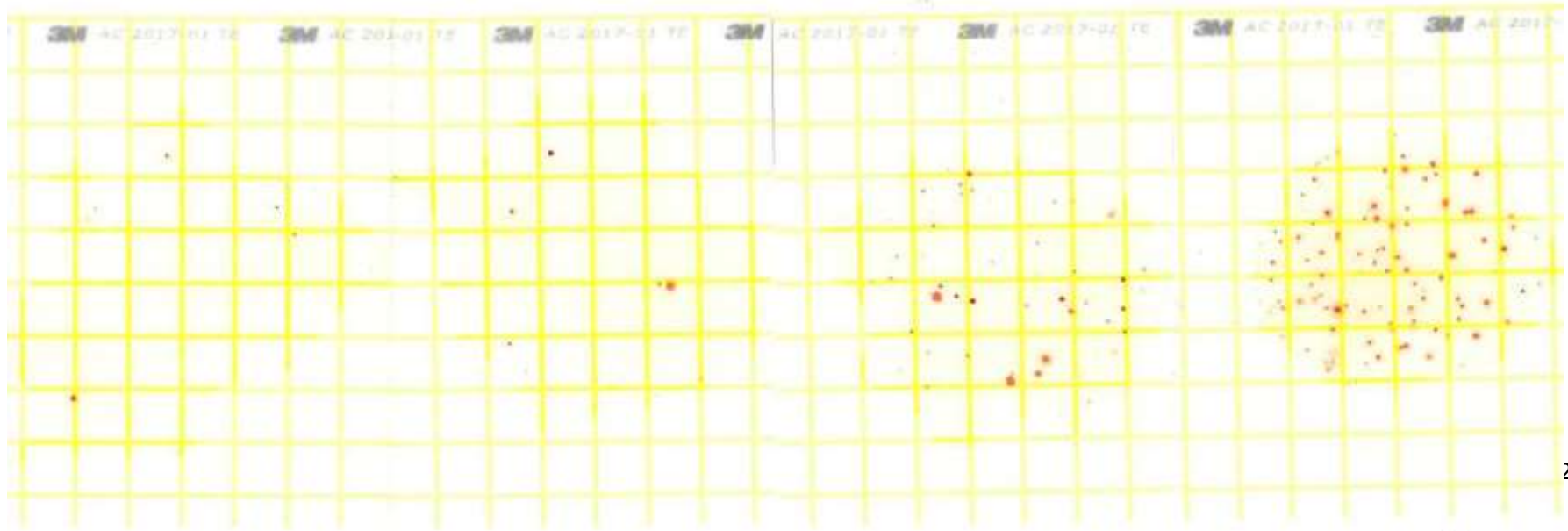
Day 1

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

Without use of disinfection

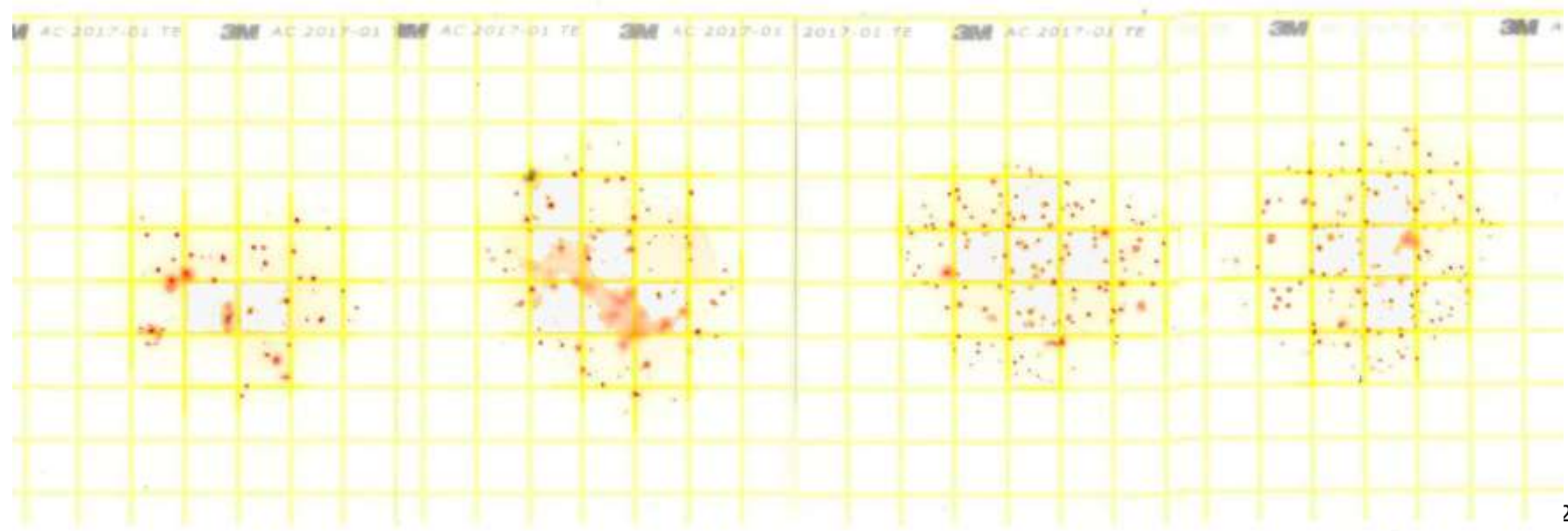
Day 2

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

Without use of disinfection

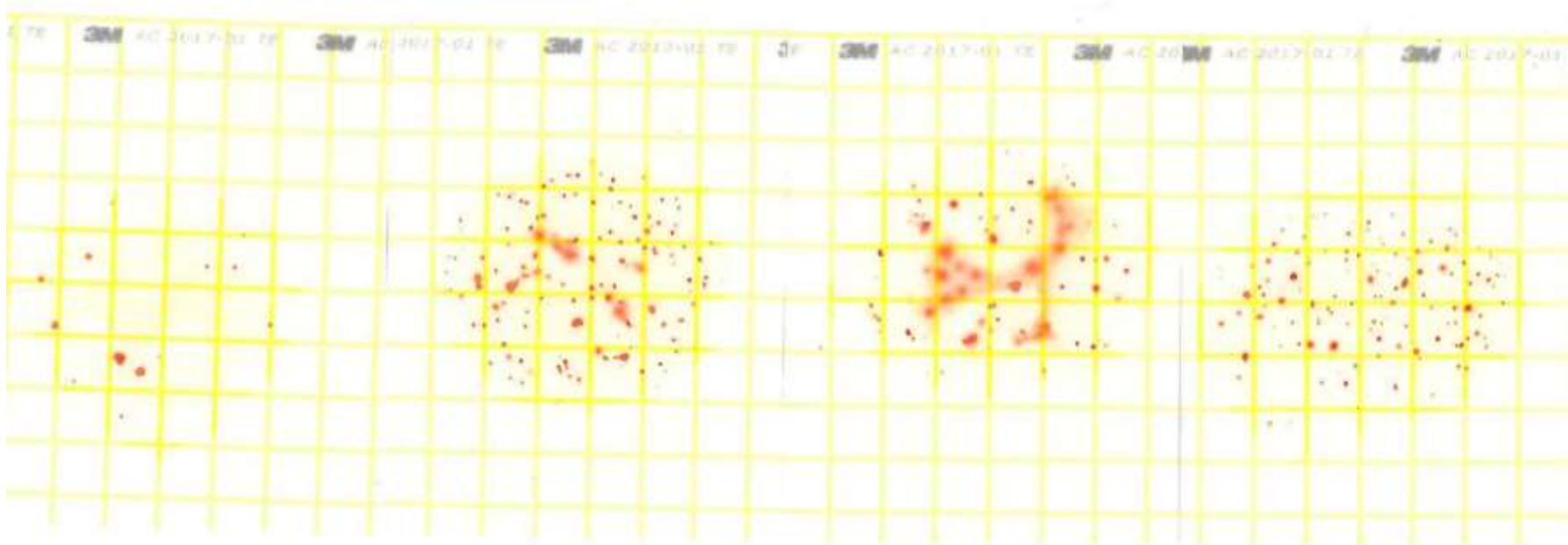
Day 3

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

Without use of disinfection

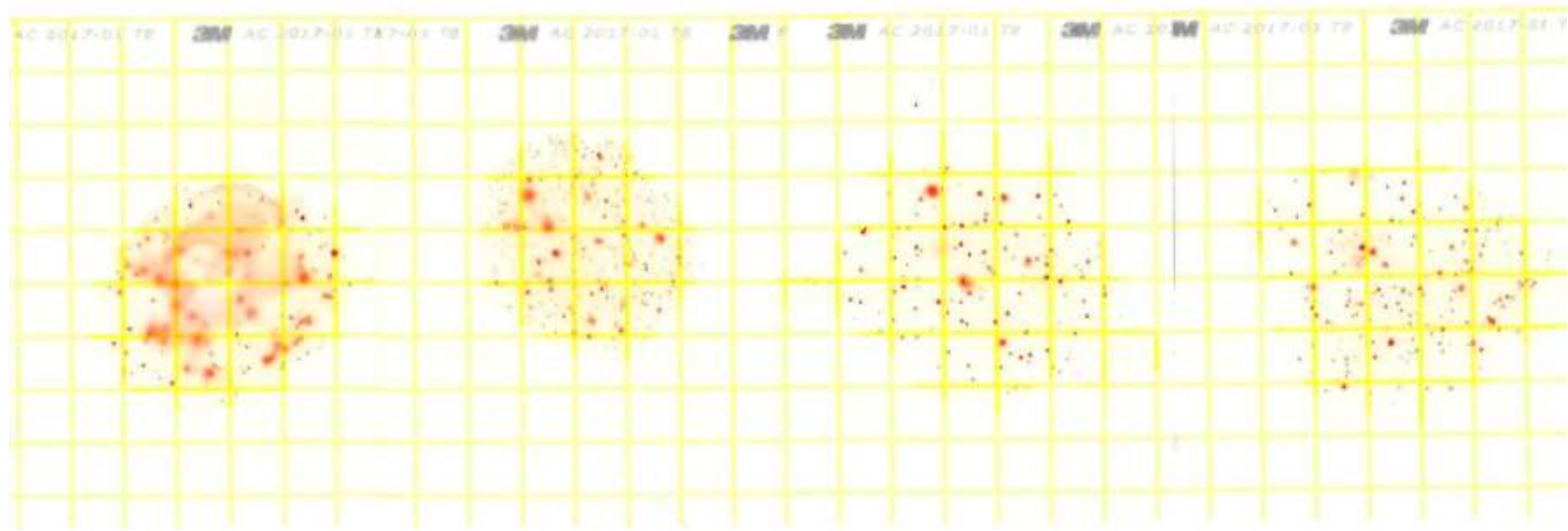
Day 4

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

Without use of disinfection

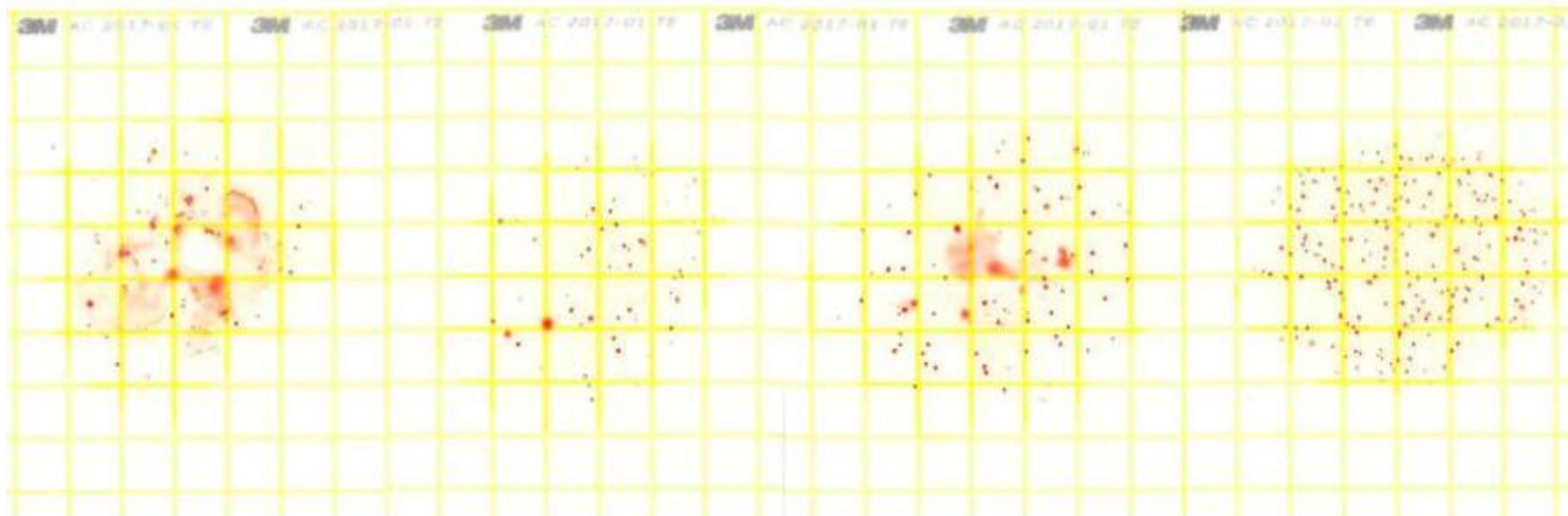
Day 5

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Appendix 4:

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

With use of "BioScrub" 5% as disinfection

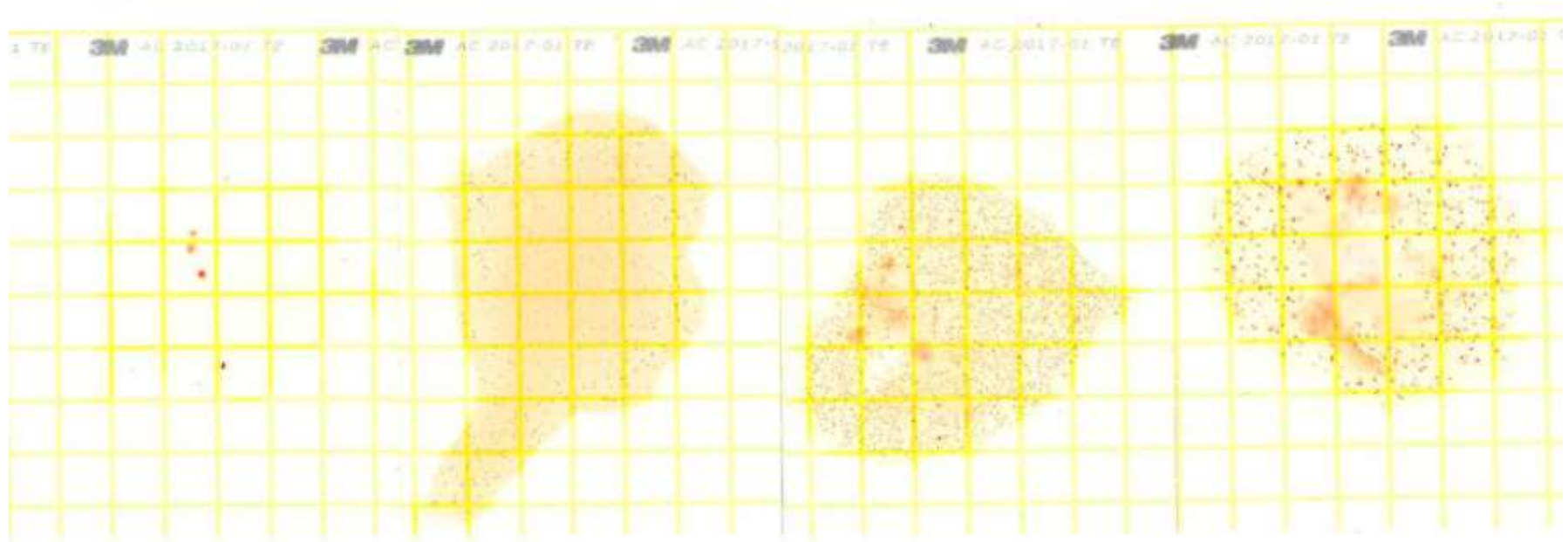
Day 1

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

With use of "BioScrub" 5% as disinfection

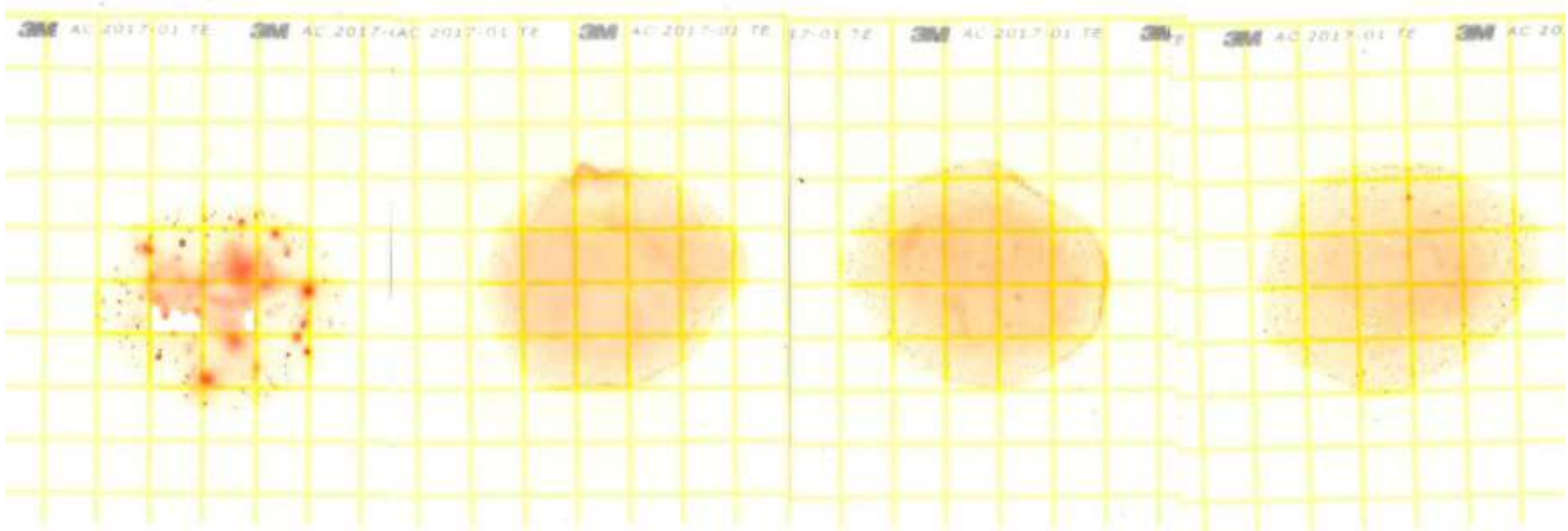
Day 2

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

With use of "BioScrub" 5% as disinfection

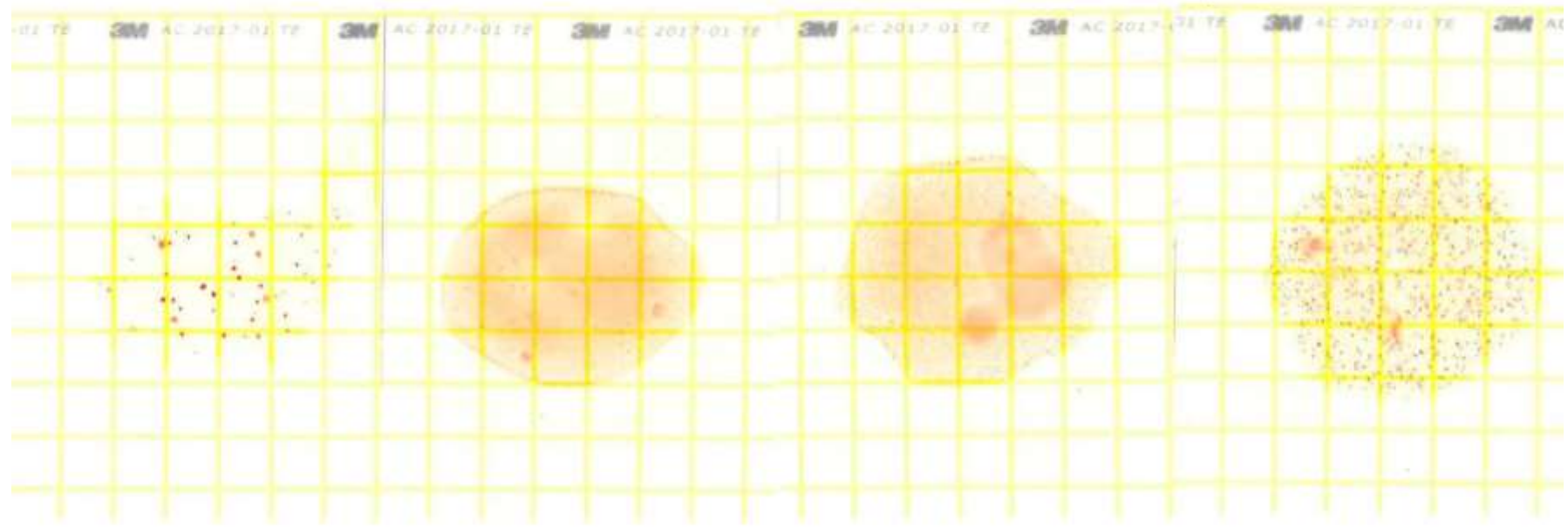
Day 3

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

With use of "BioScrub" 5% as disinfection

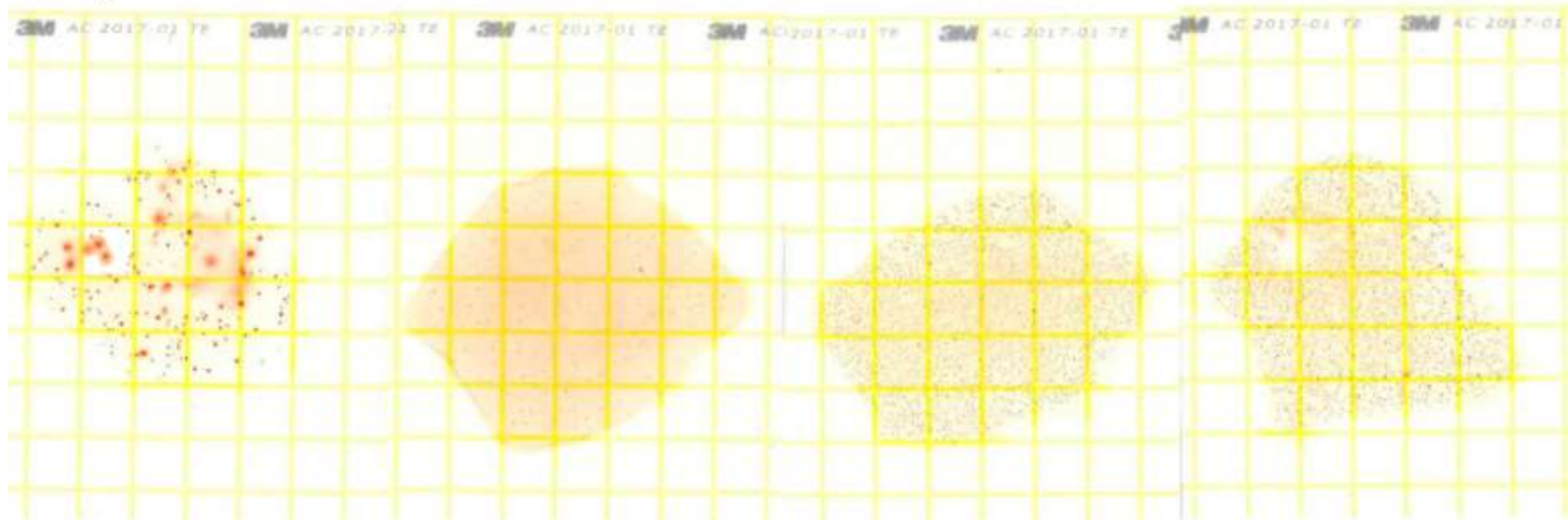
Day 4

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Red (toilet cleaning)

With use of "BioScrub" 5% as disinfection

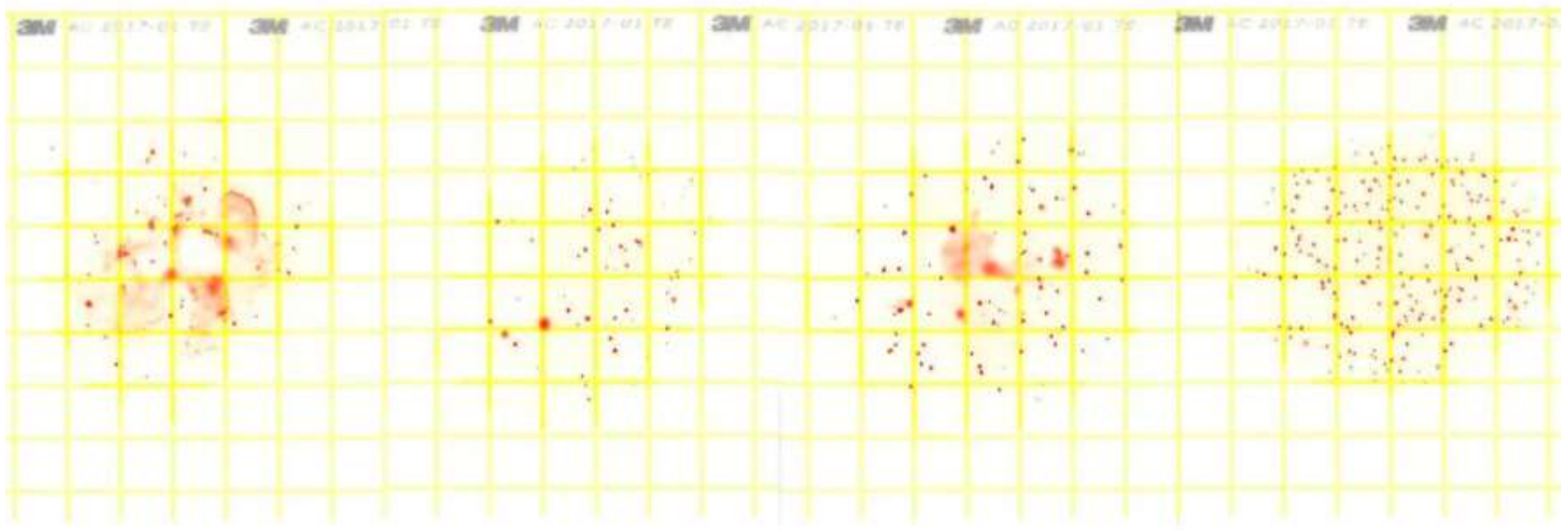
Day 5

Swipe 1

Swipe 2

Swipe 3

Swipe 4



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Appendix 5:

Bacteria count test: Cleaning gloves at Grundfos (ISS)

Blue (ordinary cleaning)

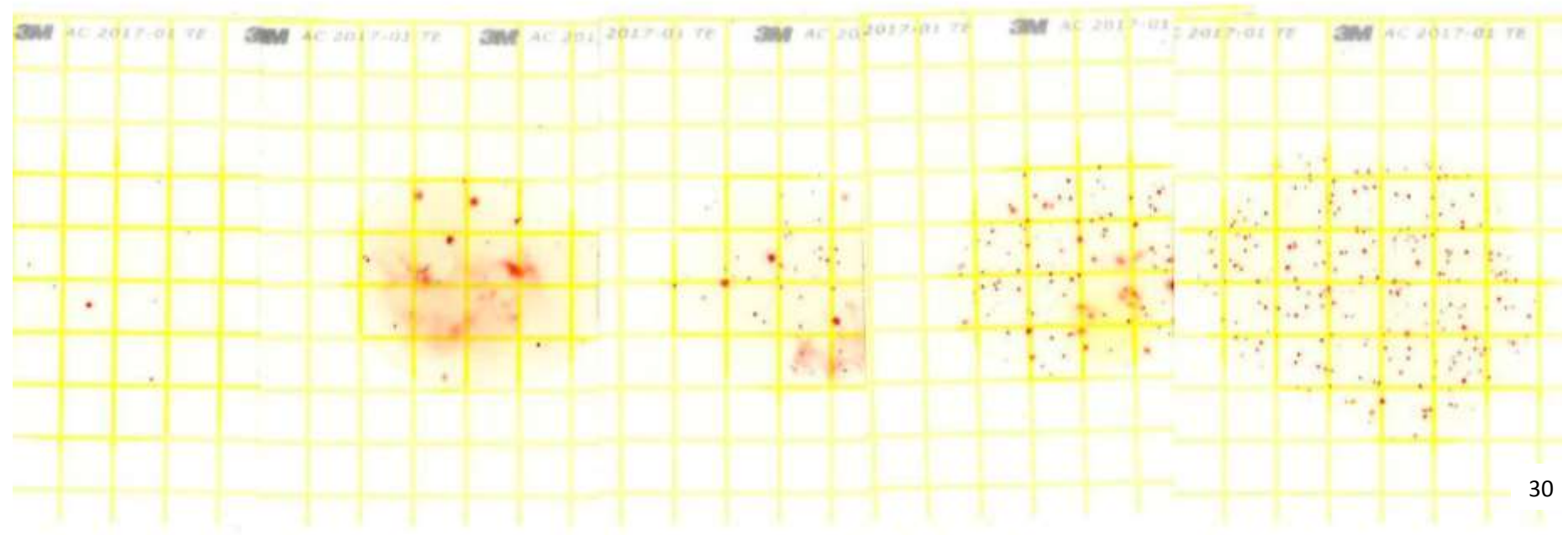
Swipe day 1

Swipe day 2

Swipe day 3

Swipe day 4

Swipe day 5



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on GloVac glove (right)

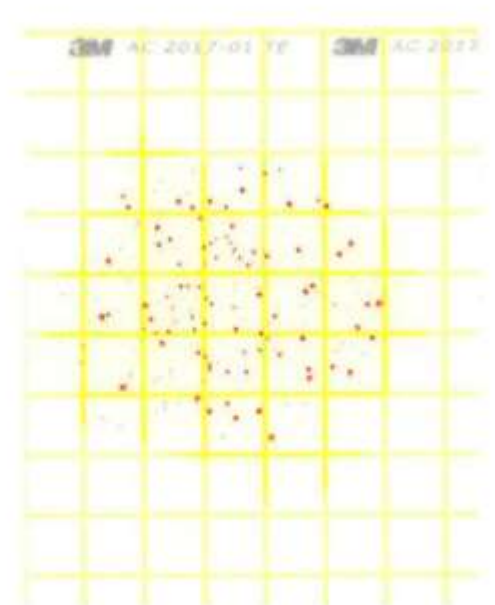
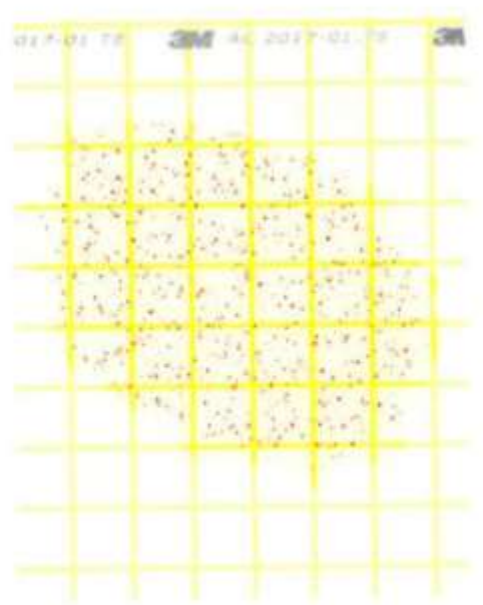
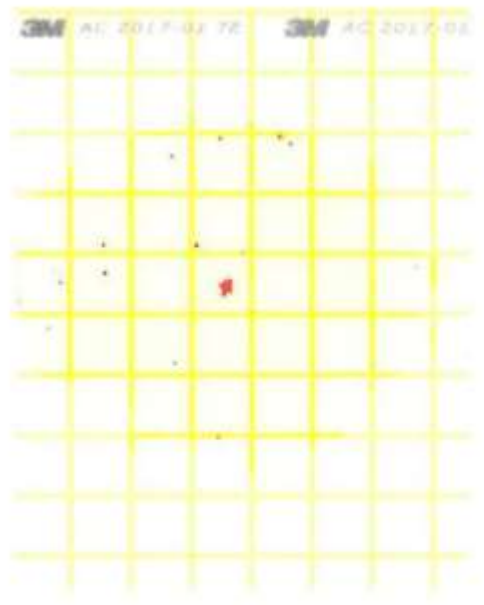
Appendix 6:

Diversey Soft Care Des E

Clean glove

Contaminated glove

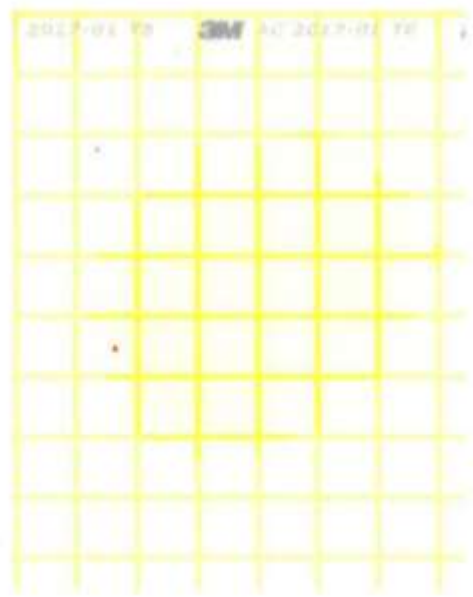
Disinfected glove



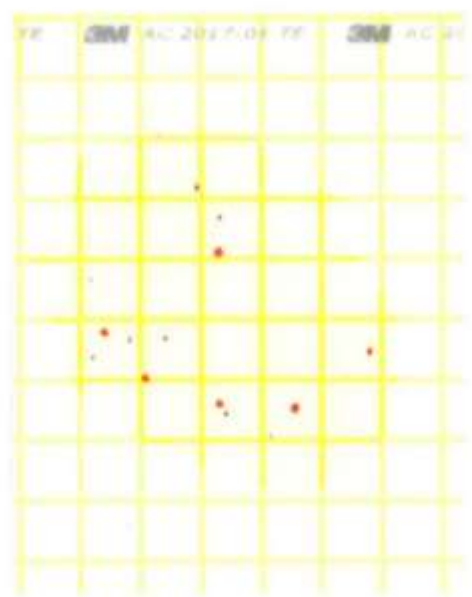
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on GloVac glove (right)
Diversey Soft Care Des E

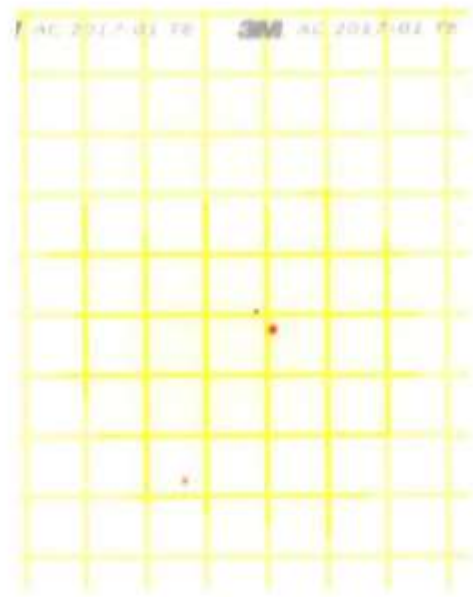
Disinfected glove
 After 1 min. in Vacuumizer



Disinfected glove
 After 2 min. in Vacuumizer



Disinfected glove
 After 3 min. in Vacuumizer



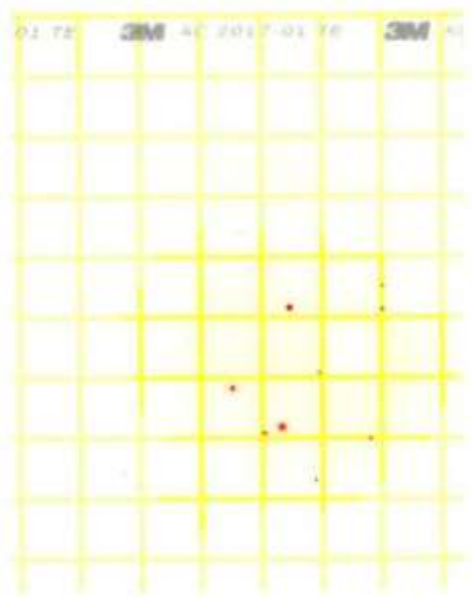
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on GloVac glove (right)

Diversey Soft Care Des E

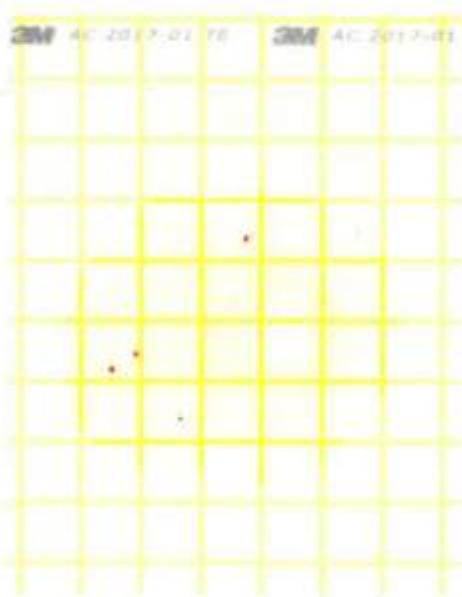
Disinfected glove

After 4 min. in Vacuumizer



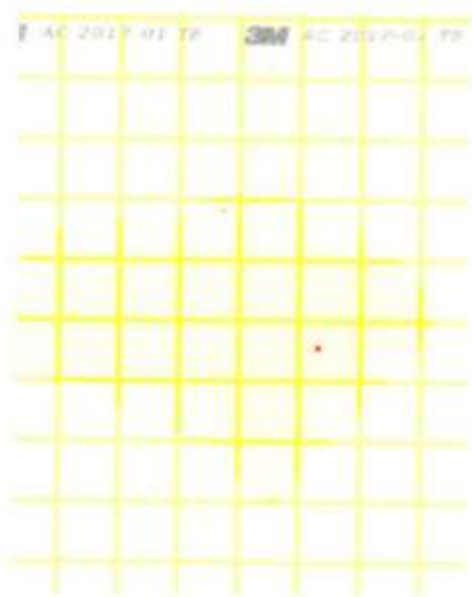
Disinfected glove

After 5 min. in Vacuumizer



Disinfected glove

After approx. 20 hours in Vacuumizer



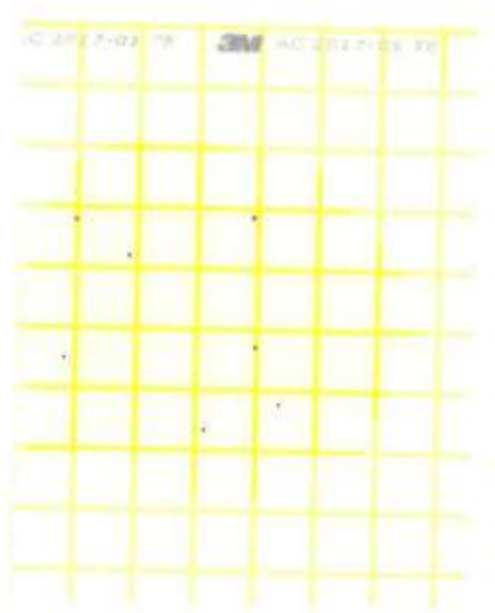
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on GloVac glove (left)

Diversey Soft Care Des E

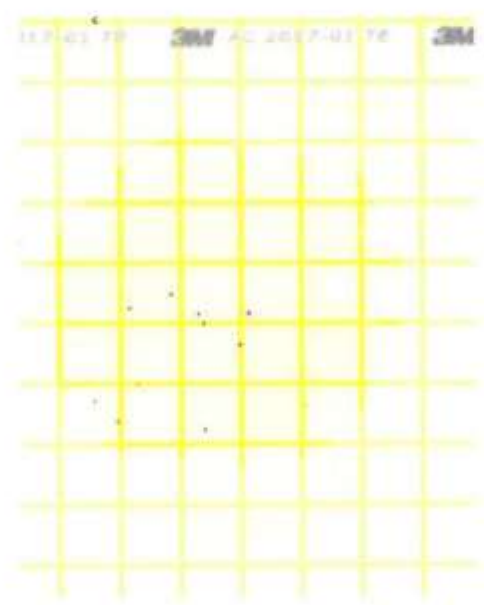
Disinfected glove

After 1 min. in Vacuumizer



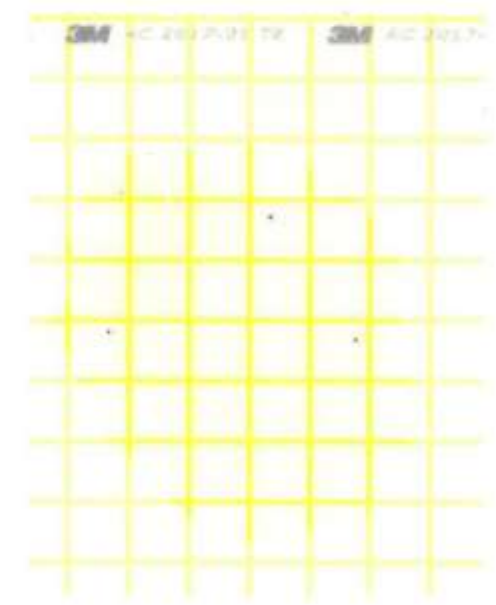
Disinfected glove

After 2 min. in Vacuumizer



Disinfected glove

After 3 min. in Vacuumizer



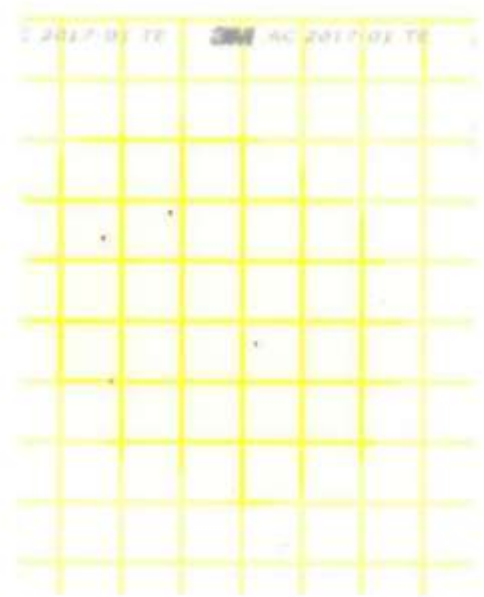
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on GloVac glove (left)

Diversey Soft Care Des E

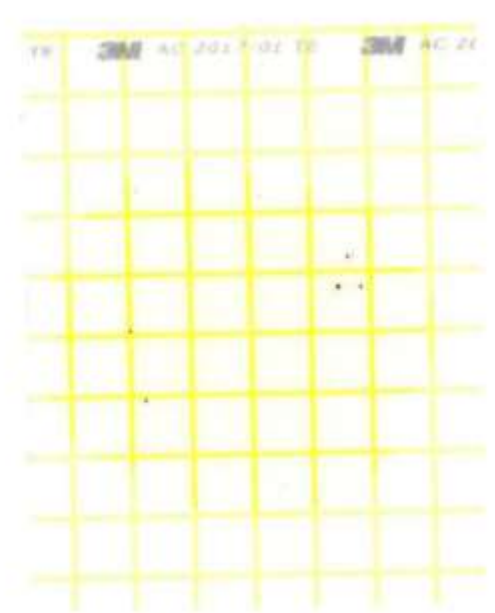
Disinfected glove

After 4 min. in Vacuumizer



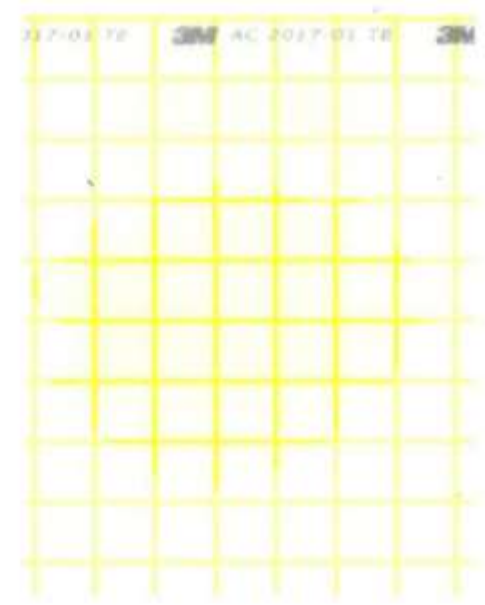
Disinfected glove

After 5 min. in Vacuumizer



Disinfected glove

After approx. 20 hours in Vacuumizer



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Appendix 7:

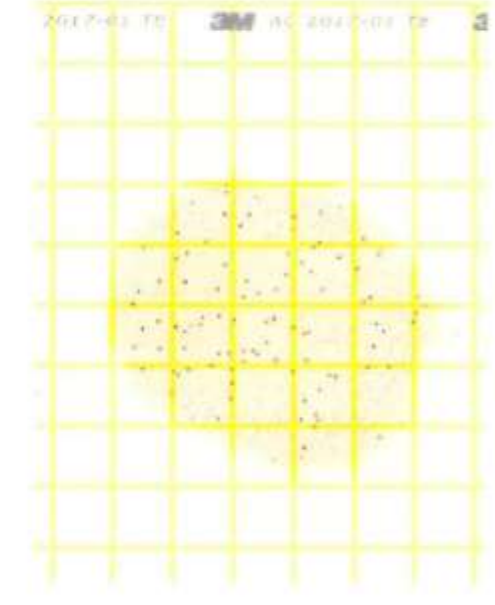
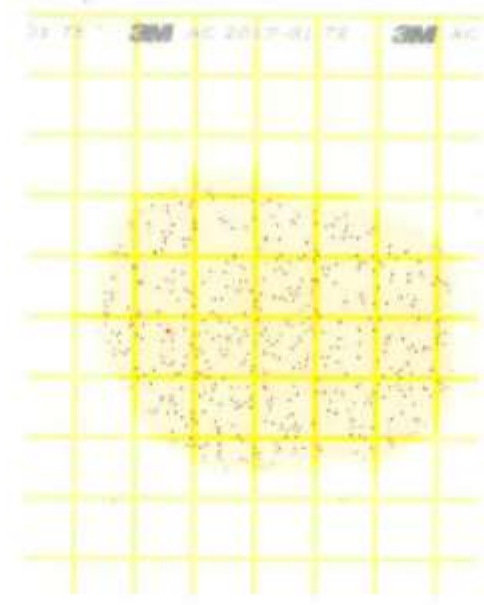
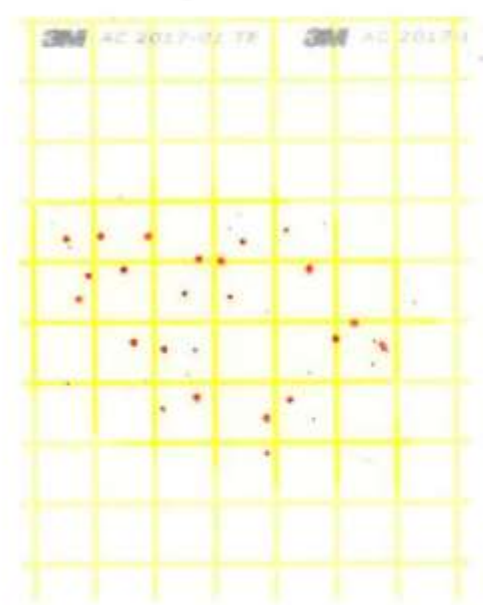
"BioScrub" bacteria count test

1%

Clean glove

Contaminated glove

Disinfected glove



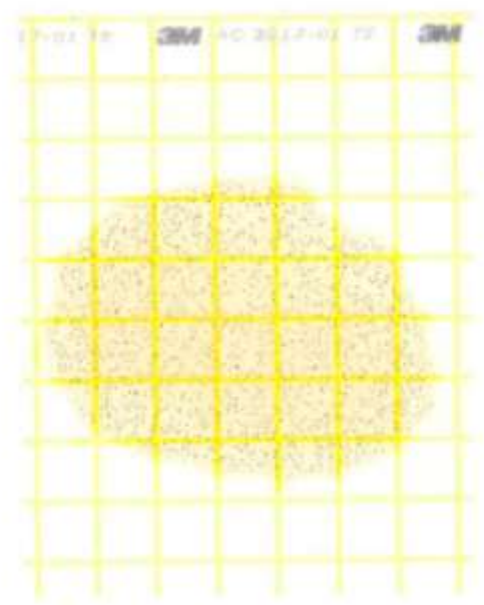
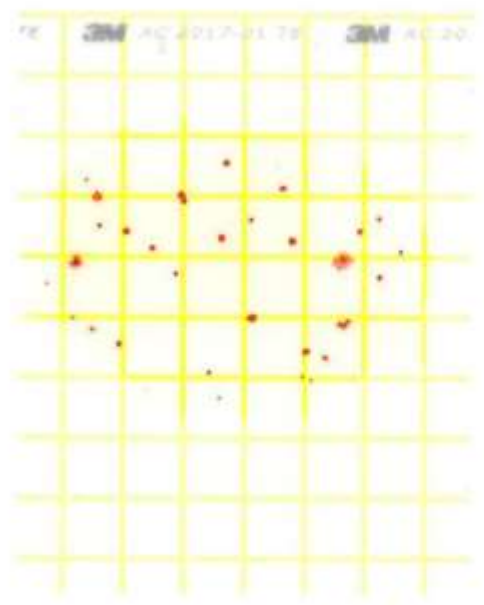
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

”BioScrub” bacteria count test
5%

Clean glove

Contaminated glove

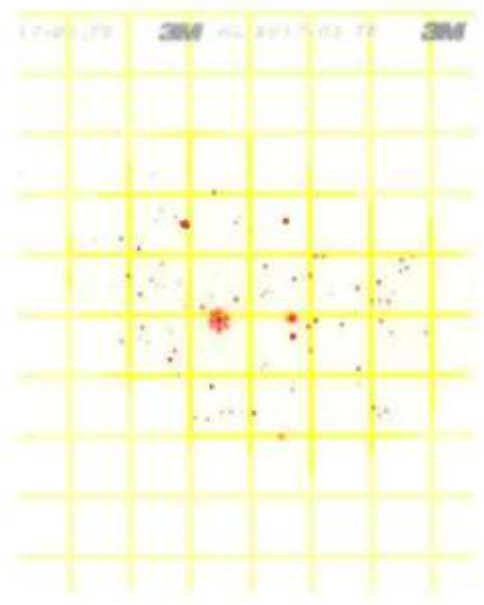
Disinfected glove



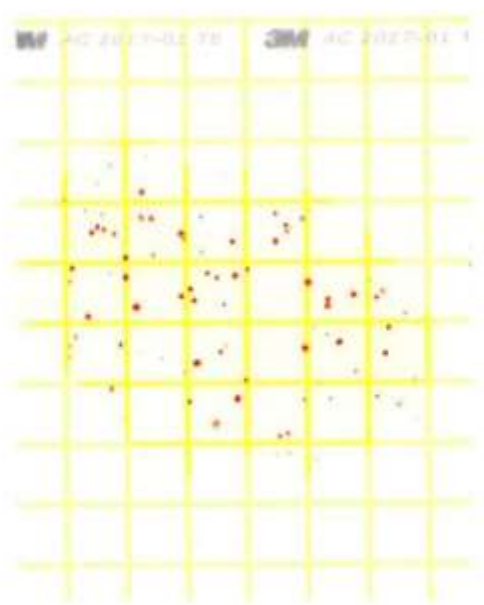
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

“Klean All” bacteria count test
0,1%

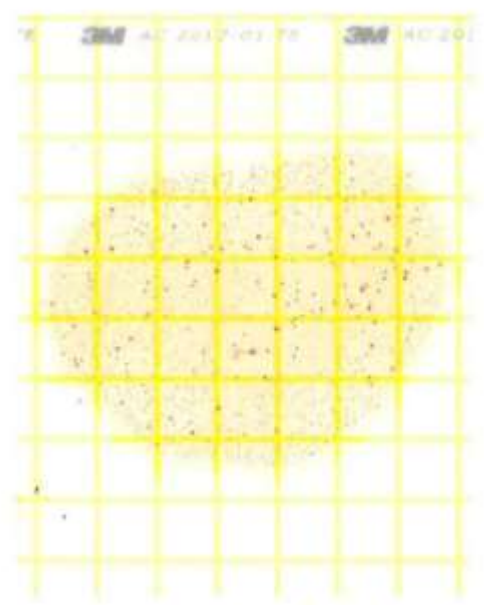
Clean glove



Contaminated glove



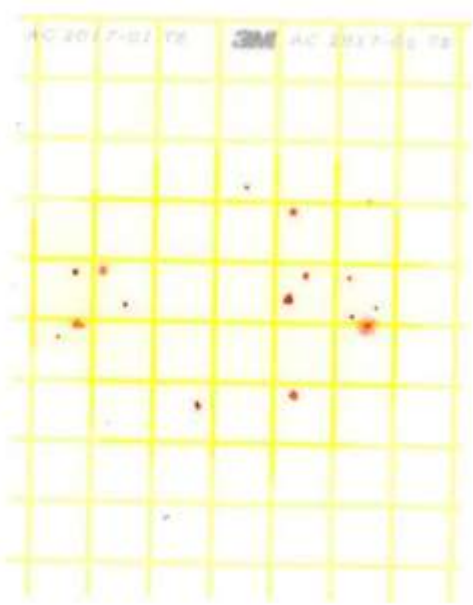
Disinfected glove



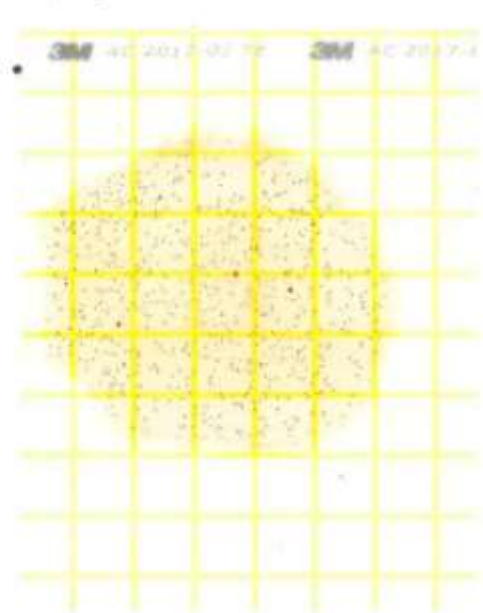
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

“Klean All” bacteria count test
0,5%

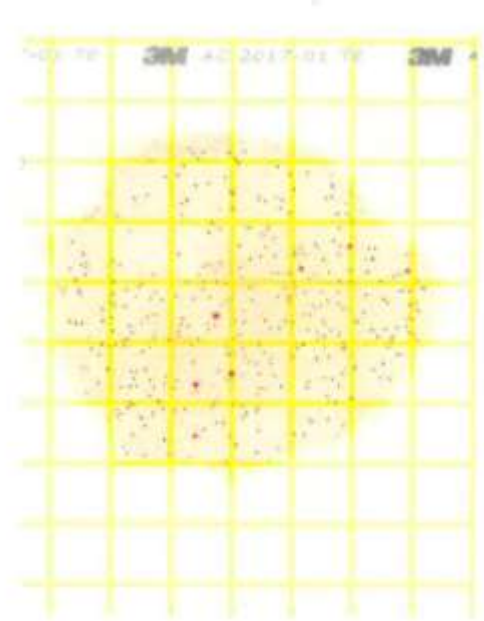
Clean glove



Contaminated glove



Disinfected glove

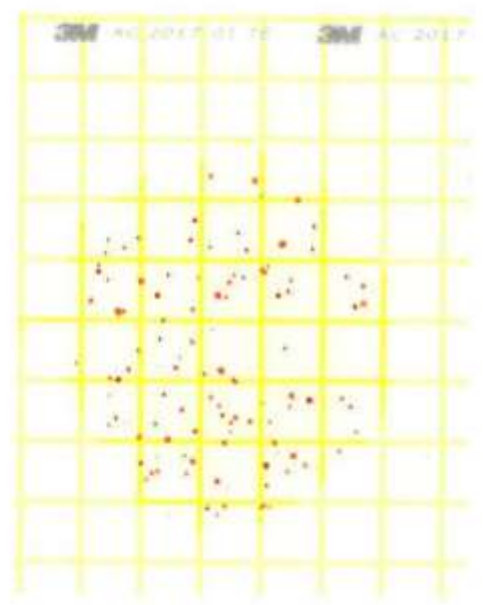


GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

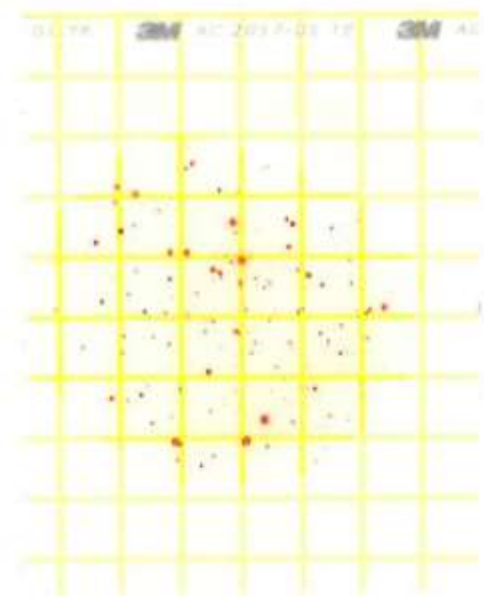
Appendix 8:

Bacteria count test Disposable nitrile glove

Clean glove



Contaminated glove



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	---	--

Appendix 9:

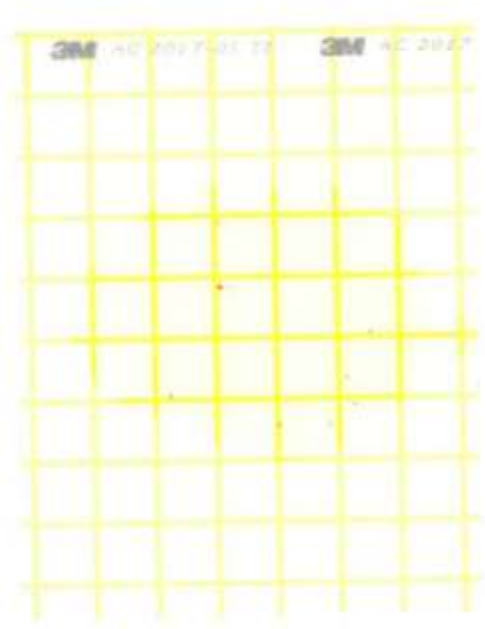
Bacteria count test on inner side of GloVac glove

The gloves are used for 10 minutes with 10 minutes pause in between.

The hands using the gloves have not been washed before use.

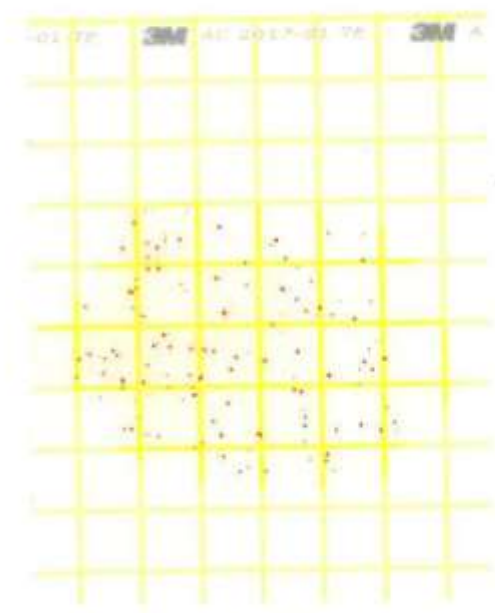
The hands are disinfected with Diversey Soft Care Des E

Clean glove



Hand swipe

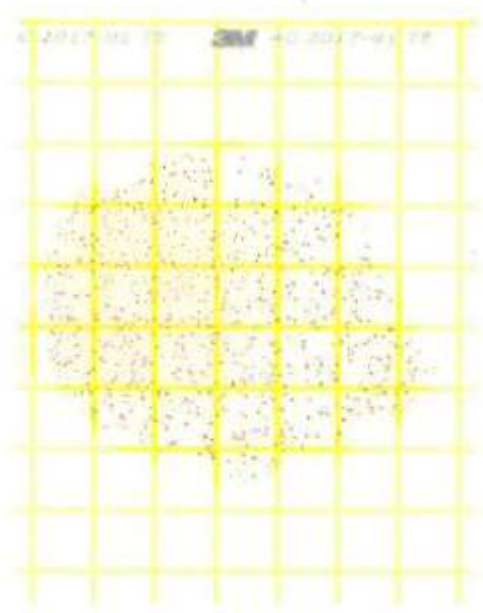
Conducted before 1. donning



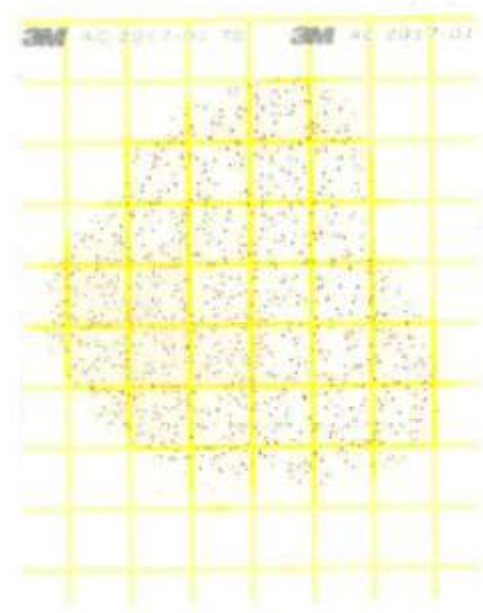
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on inner side of GloVac glove

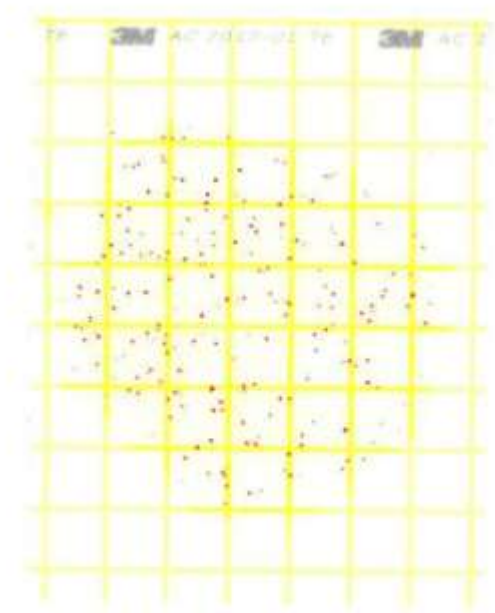
1. glove test



2. glove test



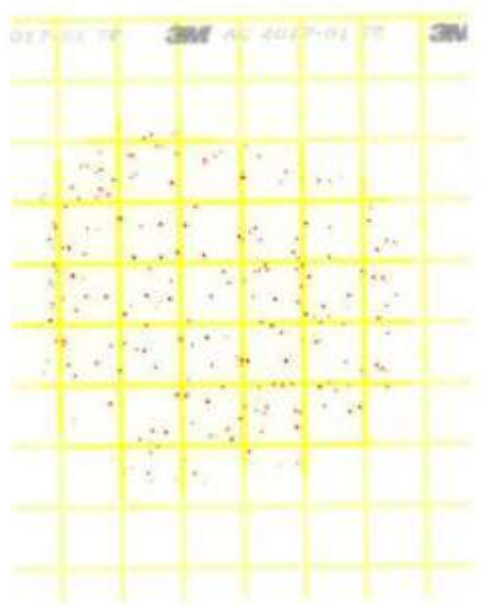
3. glove test



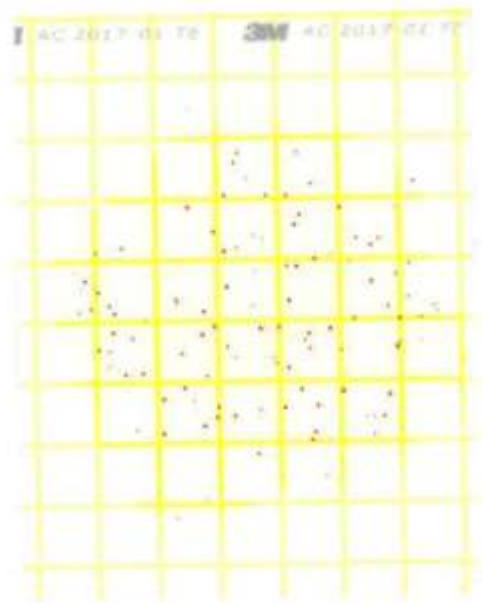
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on inner side of GloVac glove

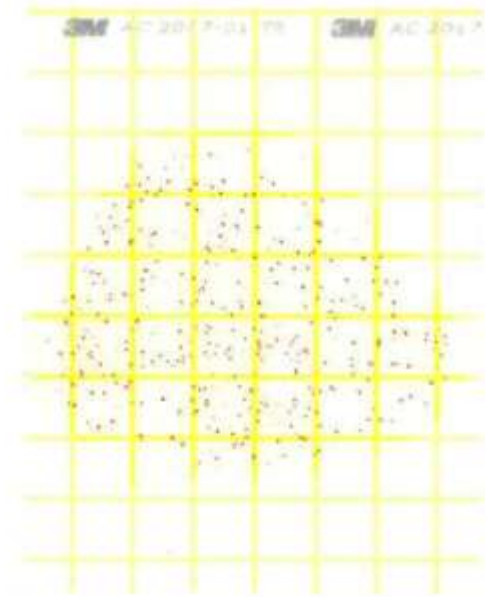
4. glove test



5. glove test



6. glove test

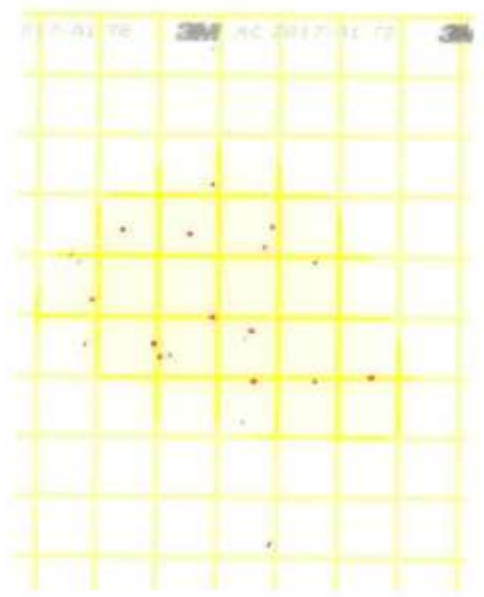


GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Bacteria count test on inner side of GloVac glove

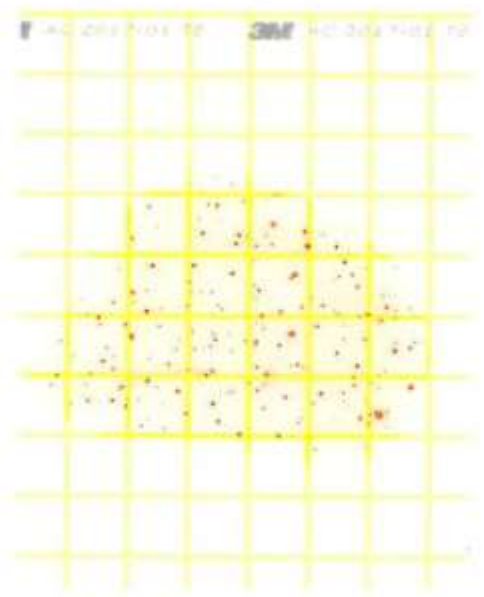
7. glove test

Approx. 16 hours after first donning



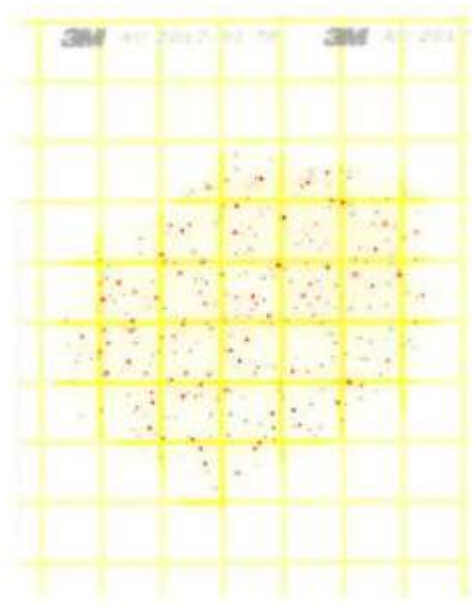
2. glove test

Immediately after 10 min. use with disinfected hand



3. glove test

10 minutes after 10 min. use with disinfected hand



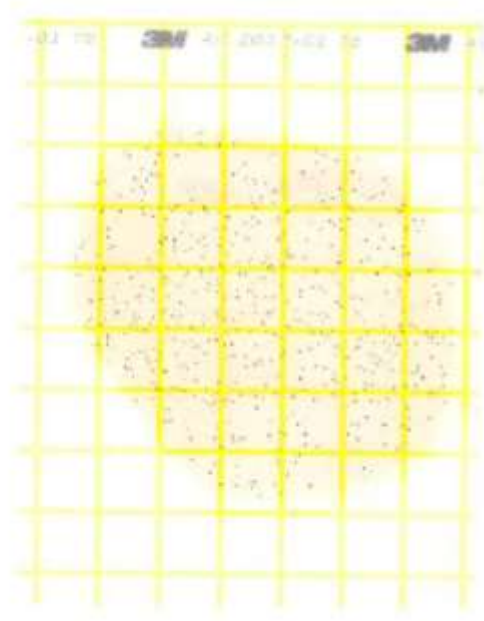
GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

Appendix 10:

"BioScrub" bacteria count test

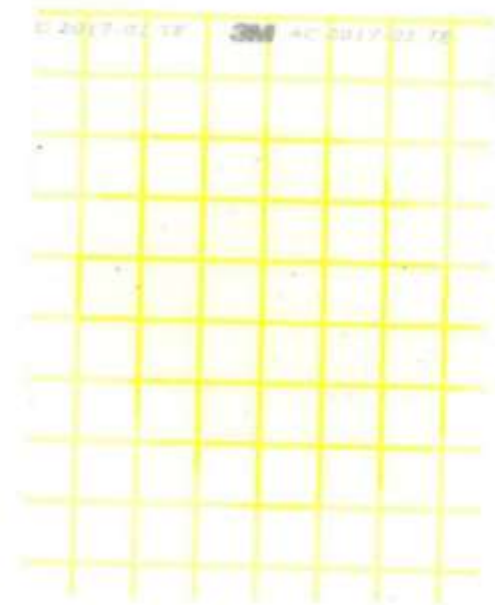
Rinsing with water

Contaminated glove



Glove rinsed in cold water

After 30 minutes in Vacuumizer



GloVac ApS	Title: Total bacteria count test of the GloVac glove system at Grundfos	Test report date: 2016-02-08
-------------------	--	--

”BioScrub” bacteria count test
5% + rinsing with water

Contaminated glove

Glove disinfected with BioScrub 5%
and rinsed in cold water

After 30 minutes in Vacuumizer

