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Effectiveness of Hypochlorous acid in hospital disinfection

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INTRODUCTION & AIM

Cleaning and disinfecting hospital surfaces is essential in preventing infections. The emergence of microorganisms that are increasingly resistant to antibiotics also makes it crucial to use products capable of eliminating them definitively.
Ideally, a disinfectant should be effective against all types of microorganisms, harmless, preserve the integrity of materials, easy to apply, safe, environmentally friendly, and comply with efficacy standards and European biocides regulations (528/2012 CE).
At Clinica Universidad de Navarra, we started using nebulized hypochlorous acid in March 2022, as it meets many of these characteristics. However, we first wanted to assess its effectiveness. To do so, we carried out surface cultures of frequently contaminated areas in isolation rooms of discharged patients and in operating rooms post surgery before and after fogging with hypochlorous acid.

We used BM-20-L system for applying dry mist in theatres

And BYOPLANET® Electrostatic Sprayer System for fogging hospital areas

METHOD

The disinfection was performed by two different methods. First fogging hypochlorous acid (Klorxitol®) using the BYOPLANET® ELECTROSTATIC SPRAYER SYSTEM. The application time depended on the size of the room, but generally, it is a quick process, in which no special PPE is required for staff, sealing the ventilation systems is not necessary, and it can even be applied in occupied areas if needed.
Secondly we applied the same product using BM-20-L dry mist system in operating rooms, where we would apply the product for 15 seconds and then let it settle for 5 minutes.
We took cultures before the disinfection (once cleaning had already been done) and after the nebulization of hypochlorous acid.
To choose the areas to culture, we based our selection on those that are routinely used to audit cleanliness and that had been previously used to measure the efficacy of disinfectants we have used in the past.
The surfaces were the edge of the table used by the patient as a tray in the bed, the nurse call button, the bed rail, the central part of the chair where the patient sat, and the flush button of the toilet (the area where the culture was taken is marked in the lower image with a blue circle).
Statistical analysis was performed using the IBM SPSS program. The absolute reduction of the number of CFUs was calculated, as well as the relative reduction. A paired Student's T-test was calculated. Confidence intervals for the mean were calculated, and box plot diagrams were created.




In the operating rooms the surfaces sampled included the head and feet of the surgical table, keyboards, surgical instrument tables, and elbow push pads for theatre doors.
Statistical analysis was conducted using IBM SPSS, calculating the absolute reduction in Colony-Forming Units (CFU) from the samples taken prior and post to disinfection. We used paired Student's t-tests and confidence interval calculations, presenting results with BoxPlot diagrams.

RESULTS & DISCUSSION

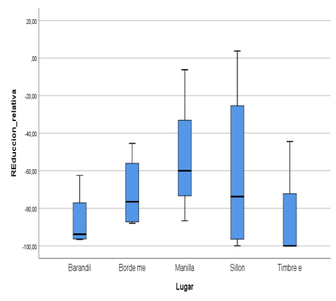
Both application methods demonstrated significant efficacy. The BYOPLANET® Electrostatic Sprayer System showed a significant reduction in CFU ($P < 0.001$). Specific surfaces with significant reductions included the bed rail ($p = 0.002$) and table edge ($p = 0.019$), though the cistern handle was not significant ($p = 0.171$). In the only case where the reduction was not observed (armchair of the first room), the sample was taken incorrectly, not respecting the product´s drying time.
The mist system also showed a significant CFU reduction. The mean CFU count decreased from 20.17 (95% CI -2.05 – 62.39) with a SD of 30.7 before disinfection to 8.33 (95% CI -11.59 – 28.25) with a SD of 18.98 after disinfection ($p = 0.031$).

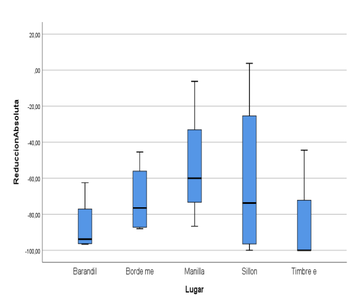
ROOMS BY FOGGING

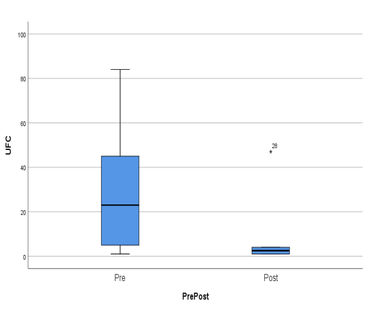
NUM	SITE	ROOM	B	A	ROOM	B	A	ROOM	B	A	ROOM	B	A
1	Bed tray	1ª	55	30	2ª	30	10	3ª	50	6	4ª	22	3
2	Call bell	1ª	18	10	2ª	2	0	3ª	8	0	4ª	7	0
3	Bed rail	1ª	24	2	2ª	>100	4	3ª	30	1	4ª	16	6
4	Arm chair	1ª	80	83	2ª	100	7	3ª	12	0	4ª	22	10
5	Toilet flush	1ª	16	15	2ª	>100	40	3ª	30	12	4ª	15	2

OPERATING THEATRE BY MISTING

NUM	SITE	PLACE	B	A	PLACE	B	A	PLACE	B	A	PLACE	B	A	PLACE	B	A
1	Headrest on surgical table	OR 4	45	0	OR 5	1	0	OR 3	0	0	OR 4	0	0	OR 9	0	0
2	Instrument table	OR 4	0	0	OR 5	0	2	OR 3	0	0	OR 4	0	0	OR 9	0	0
3	Door elbow push pad	OR 4	84	47	OR 5	21	3	OR 3	0	0	OR 4	0	0	OR 9	0	4
4	Keyboard	OR 4	25	0	OR 5	0	0	OR 3	0	0	OR 4	0	0	OR 9	0	0
5	Feet of surgical table	OR 4	5	0	OR 5	0	1	OR 3	0	0	OR 4	0	0	OR 9	0	1







CONCLUSION

The use of hypochlorous acid has proven to be a much more practical method for disinfecting an area after the presence of a patient isolated due to multidrug-resistant organisms.

- It is harmless, so it does not require altering the ventilation system of the area, the use of specific PPE by staff, and it can be administered in the presence of patients if necessary.
- Its administration and action time is faster than other products.
- It has similar efficacy to other products we had used in the past, which were either more toxic or more expensive.
- No safety intervals are required.
- Safe storage, non-flammable, and no hazard indicators.

FUTURE WORK / REFERENCES

•Urushidani M, Kawayoshi A, Kotaki T, Saeki K, Mori Y, Kameoka M. (2022). Inactivation of SARS-CoV-2 and influenza A virus by dry fogging hypochlorous acid solution and hydrogen peroxide solution. PLoS One. 2022 Apr 7;17(4) . doi: 10.1371/journal.pone.0261802. PMID: 35389997; PMCID: PMC8989197.
•Kuan-Che F, Anish G, Haijiao L, et al. Efficacy of hypochlorous acid (HOCl) for sanitizing surfaces against Enterococcus faecalis. American Journal of Infection Control. doi: https://doi.org/10.1016/j.ajic.2022.03.009.