MONITORING OF HEALTH PRODUCTS CLEANING WITH ADENOSINE TRIPHOSPHATE TESTING

Monitoramento da limpeza de produtos para saúde com teste adenosina trifosfato

Monitoreo de la limpieza de productos para la salud con test adenosín trifosfato

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ABSTRACT: Purpose: Evaluating the cleaning quality of health products by using the surface adenosine triphosphate (ATP) test in a Central Sterile Services Department. **Method:** It is a descriptive, cross-sectional study with a quantitative approach, conducted in a private clinic in Belo Horizonte, Minas Gerais. Twenty-six survey forms with 102 ATP tests were evaluated between May 2017 and May 2018. **Results:** The numbers in ATP tests in the lumened instruments vary from 55 to 206 relative luminescence units (RLU), with a mean of 124±46. In surgical instruments, results alternated between 14 and 82 RLU, with a mean of 54±28. **Conclusion:** ATP tests are not specific, but they suggest absence of residues in all the instruments. The conclusion is that a proper physical structure, evidence-based cleaning protocols and human and material resource management contribute to ensure the cleaning process quality.
Keywords: Equipment and supplies. Housekeeping. Disinfection. Sterilization.

RESUMO: Objetivo: Avaliar a qualidade da limpeza dos produtos para saúde utilizando o teste de superfície adenosina trifosfato (ATP) em um Centro de Materiais e Esterilização. **Método:** Trata-se de um estudo transversal, descritivo, de natureza quantitativa, realizado em uma clínica particular de Belo Horizonte, Minas Gerais. Foram avaliados 26 formulários com 102 testes de ATP entre maio de 2017 e maio de 2018. **Resultados:** Os valores dos testes de ATP nos canulados variaram de 55 a 206 unidades relativas de luz (RLU), com média de 124±46. Para instrumentais, os resultados alternaram entre 14 e 82 RLU, com média de 54±28. **Conclusão:** Os testes de ATP não são específicos, mas sugerem ausência de resíduos em todos os instrumentais. Conclui-se que uma estrutura física adequada, protocolos de limpeza baseados em evidências e o gerenciamento de recursos materiais e humanos contribuem para a garantia da qualidade do processo de limpeza.
Palavras-chave: Equipamentos e provisões. Serviço de limpeza. Desinfecção. Esterilização.

RESUMEN: Objetivo: Evaluar la calidad de la limpieza de los productos para la salud utilizando el test de superficie adenosín trifosfato (ATP) en un Centro de Materiales y Esterilización. **Método:** Se trata de un estudio transversal, descriptivo, de naturaleza cuantitativa, realizado en una clínica particular de Belo Horizonte, Minas Gerais. Fueron evaluados 26 formularios con 102 test de ATP entre mayo de 2017 y mayo de 2018. **Resultados:** Los valores de los test de ATP en las cánulas variaron de 55 a 206 unidades relativas de luz (RLU), con promedio de 124±46. Para instrumentales, los resultados alternaron entre 14 y 82 RLU, con promedio de 54±28. **Conclusión:** Los test de ATP no son específicos, pero sugieren ausencia de residuos en todos los instrumentales. Se concluye que una estructura física adecuada, protocolos de limpieza basados en evidencias y la gestión de recursos materiales y humanos contribuyen para la garantía de la calidad del proceso de limpieza.
Palabras clave: Equipos y suministros. Servicio de limpieza. Desinfección. Esterilización.

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INTRODUCTION

The Central Sterile Services Department (CSSD) is defined as a functional unity intended for the processing of health products (HP). Its mission is to provide HP for surgical, care and diagnostic services, guaranteeing the quantity and the quality of resources for safe assistance[1].

The CSSD has a peculiar role in the health context, acting directly in the fight against infections related to health care (IRHC). Any failure occurring during the processing of HP implies the possible compromising of the sterility, enabling the occurrence of infectious events during hospitalization or after discharge[2].

In order to ensure the quality of all processing stages, it is essential that the CSSD has the appropriate infrastructure, in accordance with current legislation. Currently, the classifications of this support sector are defined as level I CSSD, being the site that performs the processing of non-critical, semi-critical and critical HP of non-complex conformation, subject to processing; and level II CSSD, defined as the site that performs the processing of non-critical, semi-critical and critical HP of complex and non-complex conformation, subject to processing[1].

In addition, it is necessary for the support sector to have quality in all internal processes, such as the receipt of contaminated HP, cleaning, preparation, sterilization, storage and distribution of HP. Accordingly, cleanliness is emphasized as the primary step for ensuring a safe disinfection or sterilization[1,2].

Among the various chemical tests available on the market for validation of the cleaning process, the adenosine triphosphate (ATP) test is highlighted, which is not replaceable by chemical, physical and biological indicators. The ATP test measures the cleaning of devices, endoscopes and environmental surfaces. Its reading is performed quantitatively, through bioluminescence, searching for the energy source present in living cells according to the degree of contamination. Light measurement requires the use of the luminometer, and the results are emitted in relative luminescence unit (RLU)[3].

Although ATP bioluminescence is used as a good practice in health services, it is possible to note a certain insecurity amongst professionals in what concerns to the need for intervention in the cleaning process, before releasing HP for the next stages. This fact can be attributed to the results of ATP, which present a great variation of values during the execution of the test[4-6]. In addition, the literature does not standardize rapid-reading chemical tests that ensure when a product is clean, a fundamental requirement for ensuring effective disinfection and/or sterilization[6]. For this reason, the following question emerges: "Does the monitoring by means of the ATP test contributes to an evaluation of the desired quality parameters for HP cleaning?".

In this sense, the analysis of the parameters found in the process of validation of cleaning in CSSD can contribute to the improvement of HP processing, aiming at patient and professionals safety. The survey of the available strategies for validation of the cleaning parameters may guarantee the safety of the processes involved, as well as reduce the risk of infection. Hopelessly this study will contribute to the subject, offering results that can assist in the elaboration of protocols and serve as benchmark for health services.

OBJECTIVE

Assess the quality of HP cleaning using the ATP surface test in a CSSD.

METHOD

This is a cross-sectional descriptive study with a quantitative approach, conducted at a private clinic in Belo Horizonte, Minas Gerais, Brazil. Because it is a study that did not involve research with human beings, an opinion from the Research Ethics Committee was not necessary. However, there was formal authorization from the institution's Technical Board.

The clinic performs, on average, 1,800 consultations per month, with an average of 450 surgeries. Notable among these are the cataract extraction with intraocular lens insertion and eyelid plastic surgeries. The CSSD of the study site is classified as level II. The sector provides the employees with all standard operating procedures (SOP) for full-time access, such as: proper handling of equipment, manual and automated cleaning methods, and load release process.

The CSSD is supervised by a nurse and the operational activities are performed by two nursing assistants, who work exclusively at the sector and have between 5 and 7 years of experience in the same institution. Still on the workforce, there is an employee in charge of handling the contaminated HP and another one in charge of preparing the HP which come from the sluice room.

The sluice room has a 21-liter ultrasonic cleaner, with a connector to lumened instruments. The analysis of this specific equipment deionized water quality is performed every six months or whenever it is necessary.

In the CSSD of study, the manual and automated HP cleaning validation is carried out through visual inspection, by means of a tabletop 800% magnifying glass. It is then complemented by a Clean Trace™ Surface ATP 3M chemical test. The ATP reading is performed with the aid of the incubator (3M Clean Trace)[3].

The positive and negative control of the chemical test is performed only by the nurse in charge of the sector. The acceptance levels adopted are the following: up to 90 RLU (cut-off point) for instruments and up to 250 RLU (cut-off point) for lumened instruments. The entire process has been completely described and followed, according to SOP and the manufacturer's recommendation. When the results show values higher than the cut-off points, manual cleaning, followed by automated one, is performed again, before HP release.

Twenty-six forms have been analyzed, with a total of 102 records of ATP tests performed between May 2017 and May 2018. The values were recorded by the CSSD nurses in the "cleaning quality monitoring checklist", containing the following variables: date of cleaning, HP name, post cleaning RLU, observation fields (in case there were intercurrences) and the name of the person in charge.

Data collection was performed by the researchers themselves in July 2018, on alternate days, by means of a survey instrument that contained the same variables as the checklist. For the data processing, a descriptive statistical analysis was performed in order to present measures of central tendency (means) and absolute numbers generated by the program Epi Info 7®. The results were aggregated and presented through descriptive tables.

RESULTS

Table 1 shows the HP distribution evaluated with the ATP test during the study period. The number of instruments and lumened instruments ranged from 6 to 16 per month, with a mean of 7.8 ± 3.5. In Total, 102 (100%) ATP tests were performed between May 2017 and May 2018.

Table 2 shows ATP test results in RLU after manual cleaning, followed by the automated one. During the study period, the values of the ATP test for lumened instruments ranged from 55 to 206 RLU, with a mean of 124± 46. In what concerns the instruments, the results alternated between 14 e 82 RLU, with a mean of 54±28.

DISCUSSION

The CSSD aims at preventing infections, even indirectly, coordinating science, safety and quality, through the nursing team. When CSSD professionals are not aware of the importance

Table 1. Distribution of health products evaluated in the cleaning process with the adenosine triphosphate test.

Period	Lumened instruments* (n=51)	Instruments** (n=51)	Total (n=102)
May, 2017	03	03	06
June, 2017	03	03	06
July, 2017	03	03	06
August, 2017	05	05	10
September, 2017	02	02	04
October, 2017	08	08	16
November, 2017	03	03	06
December, 2017	05	05	10
January, 2018	03	03	06
February, 2018	03	03	06
March, 2018	03	03	06
April, 2018	03	03	06
May, 2018	07	07	14
Mean	-	-	7.8
Standard deviation	-	-	3.5
Median	-	-	06

*Dual lumen; **Tweezers, blepharostats and hooks.

of the cleaning process and perform it in a condescending or superficial manner, the dirt is not completely removed and can create barriers that protect microorganisms[6-10].

According to Article 65 of the Collegiate Board Resolution (RDC) No. 15, March 15th, 2012, the HP that can be processed, regardless of its risk rating, must be subjected to the cleaning process within the very CSSD of the health service. To this end, the cleaning of surgical instruments must be rigorously done to reduce the microbial load[1,10-13].

The cleansing process is known to be influenced by using appropriate equipment, enzymatic detergent action and the creation of evidence-based protocols. The science of processing HP, currently fairly consistent, values this process as an initial and fundamental step to guarantee the subsequent disinfection and/or sterilization phases. In addition, it states that cleaning reduces the initial microbial load by up to 99.9%, i.e., it reduces four logarithmic cycles of bioburden that are in the instruments[7,10-13].

A study conducted in a hospital in Minas Gerais, in order to validate the HP cleaning protocol, reinforced the importance of thoroughly execute this stage, by means of strongly recommended protocols. In Addition, it stressed the need for validation of safe methodologies to ensure the acceptable levels of protein and RLU for ATP testing after cleaning[9].

The Association for the Advancement of Medical Instrumentation (AAMI) recommends the use of a rapid method to determine the HP organic matter levels. In that case, the ATP provides evaluation of the parameters that surpass the visual cleaning, ensuring safety to the process[4].

The current national legislation on HP processing does not yet specify the best chemical test for cleaning validation. With that in mind, some investigations indicate that the evaluation of ATP bioluminescence can be considered an effective method for process validation, offering the opportunity to obtain rapid and objective results[1,6,9,12].

The results of this study were below 204 RLU, taking into consideration lumened instruments and other instruments. A study states that surfaces with ATP concentrations below 500 RLU can be considered clean surfaces[6]. Other authors present stricter values for cleaning validation, indicating concentrations lower than 200 RLU for less complex instruments. In the CSSD of study, the lumened instruments obtained cut-off point below 250 RLU, assigned to complex HP that have less than 5 mm of lumen or blind-end, which make them inaccessible to the cleaning process[1,5,6].

ATP is considered a strong control variable for manual and automated cleaning monitoring. When the results remain within the established parameters, it is inferred that the organic and inorganic dirt has been removed, reducing the microbial load present in the HP[5,6]. It is noteworthy that the ATP shows feasibility for proving the decontamination of instruments[5-7,12].

Table 2. Results of the adenosine triphosphate tests, in relative light units, after manual cleaning, followed by automated cleaning.

Period	Lumened Instruments*			Instruments**		
	Mean	Min	Max	Mean	Min	Max
May, 2017	98	45	205	82	10	74
June, 2017	94	50	195	09	15	85
July, 2017	116	57	189	19	07	86
August, 2017	138	45	198	06	15	85
September, 2017	134	64	209	64	12	84
October, 2017	96	54	197	75	14	82
November, 2017	128	50	204	17	18	79
December, 2017	203	48	207	72	15	79
January, 2018	48	57	220	82	15	85
February, 2018	182	63	215	75	18	88
March, 2018	71	60	205	67	15	77
April, 2018	98	64	217	53	14	85
May, 2018	204	59	214	77	12	78
Average	124	55	206	54	14	82
Standard deviation	46	-	-	28	-	-
Median	116	-	-	67	-	-

*Dual lumen; **Tweezers, blepharostats and hooks.

The proper and validated cleaning process through ATP is fundamental to a reduction of unexpected problems, such as, for instance, surgical site infections. A study[5] reinforced that the instruments must be properly processed, so that this material does not become a source of contamination and transmission of microorganisms. The CSSD plays a key role in combating IRHC, requiring adequate skilled labor to guarantee quality in the indirect care provided to the patient[5,7,9,12].

It is worth noting that cleaning and its validation stages must follow SOP elaborated with updated references and the highest level of evidence scientific studies. This document contributes to a systematization of a routine considered primordial for the HP processing science. The SOP should be available not only in the management system of a health service but must be widely disseminated to all nursing professionals working in the sector[1,13].

In light of that, the activities involved in the CSSD are essential for patient safety. The quality of internal processes, particularly cleaning, with consequent validation by ATP test is considered a good practice that must be valued, standardized and disseminated in health services.

CONCLUSION

This study made it possible to analyze HP monitoring through ATP testing and reinforced the importance of validation of the cleaning process as a safe practice in health services. All parameters remained within the desired values, evidencing absence of living cell residues in all instruments analyzed.

The validation of the cleaning process contributes to the patient's safety and consequent reduction of infectious events. The available strategies for validating this specific process parameters must be disseminated, valued and followed in their entirety, in order to improve the processes in CSSD.

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