



DISINFECTION AS A TOOL IN THE PREVENTION OF NOSOCOMIAL INFECTIONS IN PHARMACIES

¹Veszelits Lakticová K., ¹Vargová M., and ²*Zigo F.

¹Department of the Public Veterinary Medicine and Animal Welfare, University of Veterinary Medicine and Pharmacy, Košice, Slovakia.

²Department of Animal Nutrition and Husbandry, University of Veterinary Medicine and Pharmacy, Košice, Slovakia.

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ABSTRACT

The importance of hygiene in medical and pharmaceutical facilities has its justification. Regular sanitation and disinfection of pharmacy premises are among the most basic activities that contribute to the protection of the patients health and pharmacy workers. It also ensures the preparation of medication is done safely. The disinfectants used must be effective enough to increase the hygiene level of the pharmacy. In our work, we evaluated the effectiveness of 1 % DisiClean Profi disinfectant with a exposure time 60 minutes on various surfaces in the premises of the pharmacy from the point of view of preventing nosocomial infections. We monitored the microbiological load of the environment of selected parts of the pharmacy at different time intervals, during the day and after disinfection. The drug dispensing area, waiting room, laboratory were evaluated. From the microbiological

parameters, the total numbers of microorganisms and coliform bacteria were evaluated. The monitored numbers of microorganisms increased dynamically during operation in the various evaluated parts of the pharmacy. We recorded the highest number of monitored microorganisms during the day in the waiting room on the pharmacist's desk, a place where there is intensive contact of the patient with the surface. We detected 5 CFU of the total count of bacteria and 1 CFU of coliform bacteria at this place. After disinfection, total numbers of microorganisms as well as coliform bacteria were not detected on selected surfaces in all evaluated parts of the pharmacy. Based on all obtained microbiological results after disinfection taken from various monitored surfaces in the evaluated pharmacy, we can

*Corresponding Author

Assoc. Prof. Zigo

František, DVM., PhD.,

Department of Animal
Nutrition and Husbandry,
University of Veterinary
Medicine and Pharmacy,
Komenského 73, 040 01
Košice, Slovakia.

conclude that the DisiClean Profi polymer disinfectant used in a 1 % concentration with an exposure time of 60 minutes was highly effective on all evaluated surfaces in the monitored parts of the pharmacy.

KEYWORDS: DisiClean Profi, disinfection, microbiological swabs, pharmacy, nosocomial infections.

INTRODUCTION

Hygiene is an interdisciplinary preventive health specialty that monitors and evaluates the health of the population, while introducing preventive measures to protect people's health. The goal of hygiene is to create favorable living and working conditions, protection and active development of health, prevention of diseases, prolongation of human life by increasing physical and mental fitness of a person.^[1]

The occurrence of nosocomial infections in our medical and pharmaceutical facilities is often underestimated. Strict adherence to hygiene is one of the most important measures in the fight against the occurrence of diseases.^[2]

Workers of medical and pharmaceutical facilities are exposed to various nosocomial infections, which can lead to professional damage to their health. The desired elimination of pathogenic microorganisms is achieved by correct habits in carrying out the disinfection process, thorough selection of disinfectant and correct rotation of preparations. Infectious diseases occur mainly in the period when there are deficiencies in compliance with the principles of sanitation. By observing hygiene of environment, the emergence and spread of infectious diseases can be prevented.^[3]

Disinfection is a process in which germs are destroyed by the action of chemical substances or physical interventions (heat, UV radiation) or a combination of both methods.^[4] Disinfectants act non-specifically, therefore they have a very broad spectrum of effect. They are divided mainly by chemical groups. It is necessary to take into account the effectiveness spectrum of the disinfectant we use.^[1]

In case of chemical disinfection, which is carried out using disinfectants, it is important to observe the prescribed concentration and exposure necessary to achieve the effect. The principle of rotation disinfectants is applied here, once every 2-3 months, in order to avoid

the development of resistance. The goal of disinfection is to interrupt the path of infection from the source to the susceptible individual.^[5]

The work is focused on evaluating the effectiveness of disinfection, which was carried out with disiClin Profi disinfectant in the premises of the pharmacy from the point of view nosocomial infections preventing.

MATERIAL AND METHOD

The monitored and evaluated pharmacy is among the medium-sized pharmaceutical facilities in eastern Slovakia (Figure 1, 2).



Figure 1: Evaluated pharmacy.



Figure 2: Drug dispensing area.

The pharmacy consists of drug, medical aids and additional products dispensing area, medication storage room, a laboratory, a washroom, a dressing room and an office. In practical conditions, the hygiene of different surfaces in selected areas of the pharmacy was monitored and analyzed.

Sanitation in the evaluated pharmacy is carried out according to the sanitation program, which is drawn up for each room of the pharmacy, where the responsible employee keeps a daily record of the disinfectants and procedures used. The evaluated pharmacy uses a special chlorine-free disinfection that does not harm the environment. DisiClean Profi polymeric disinfectant contains polyhexamethylene guanidine hydrochloride (Figure 3). The manufacturer of DisiClean is H2O COOL company, Zálesie, Slovakia.



Figure 3: DisiClean Profi polymer disinfectant.

To ensure regular daily hygiene in the premises of the pharmacy, a solution of DisiClean Profi disinfectant in 1 % concentration is used. The exposure time of DisiClean Profi required to achieve a biocidal effect is 15 minutes, for a bactericidal effect on *Legionella* and MRSA (Meticilín-resistant *Staphylococcus aureus*), 60 minutes is required, for a virucidal and mycobactericidal effect, it requires 60 minutes of exposure time.

The effectiveness of the DisiClean Profi disinfectant on individual surfaces was evaluated by the classical microbiological method using microbiological swabs taken during the day and after disinfection in selected parts of the pharmacy.

The monitored and evaluated rooms included drug dispensing area, a waiting room and a laboratory. The values obtained from the microbiological swabs are the average values from 5 swabs taken and are expressed in CFU (colony forming units).

Control of the disinfection effectiveness is very important in practice and serves to verify the effectiveness and quality of disinfection procedures. Microbiological control of disinfection of surfaces in the pharmaceutical facility was carried out by microbiological swabs. When the individual evaluated surfaces were dry, a sterile cotton swab was immersed in a test tube with physiological solution, and then a 10x10 cm area was wiped using a sterile template. Before inoculation, the tubes were electromagnetically disturbed. Using a pipette, the contents of the test tube in the amount of 0.1 ml were inoculated onto plates with solid nutrient medium, which were cultivated in a thermostat at 37°C for 24 hours. After incubation, the grown colonies were quantitatively evaluated. Total count of bacteria (TCB) were determined using meat peptone agar (MPA) by culturing at 37 °C for 24 hours. Coliform bacteria (CB) were determined using Endo agar (EA), which was cultured at 37 °C for 24 hours. These determinations were carried out according to the procedure of valid ISO standards.

RESULTS AND DISCUSSION

In Tables 1-3 are recorded the average values of microbiological swabs from individual monitored surfaces in different parts of the pharmacy. In Table 1 shows the results of microbiological swabs in during the day and after disinfection. We recorded 1 CFU of TCB on the window and on the door in drug dispensing area during the day. No numbers of evaluated microorganisms were present on the floor, on the shelf and on the pharmacist's desk. Disinfection is a medical procedure and is performed as indicated as part of the antiepidemic regime of every medical facility^[4] as well as pharmaceutical facilities. Disinfectant preparation DisiClean Profi belongs to substances with high disinfection efficiency, which was also confirmed by the obtained results from microbiological swabs. We recorded zero total count of bacteria and coliform bacteria on all tested surfaces after disinfection.

Table 1: Results of microbiological swabs in drug dispensing area during the day and after disinfection.

Place of collection	MPA	EA	MPA	EA
	TCB During day	CB During day	TCB After disinfection	CB After disinfection
Floor	0	0	0	0
Window	1	0	0	0
Pharmacist's desk	0	0	0	0
Shelf	0	0	0	0
Door	1	0	0	0

In Table 2 shows the results of microbiological swabs taken in the waiting room during the day and after disinfection. We recorded the highest number of monitored microorganisms during the day in the waiting room on the pharmacist's desk, a place where there is intensive contact of the patient with the surface. We detected 5 CFU of the total count of bacteria and 1 CFU of coliform bacteria at this place. An increased number of microorganisms during the day in the waiting room occurred on the door handle, where we detected 3 CFU of total count of bacteria and on the floor and table 2 CFU of total count of bacteria. No coliform bacteria counts were present in the waiting area during the day. We recorded zero counts of all monitored microorganisms after disinfection.

Table 2: Results of microbiological swabs obtained in the waiting room during the day and after disinfection.

Place of collection	MPA	EA	MPA	EA
	TCB During day	CB During day	TCB After disinfection	CB After disinfection
Floor	2	0	0	0
Table	2	0	0	0
Locker	0	0	0	0
Door handle	3	0	0	0
Pharmacist's desk	5	0	1	0

Microorganisms are found in almost every environment, but only a relatively few of them can cause human disease. The transmission of an infection from an infected person to another individual is called the process of spreading the disease or the epidemic process.^[6] Clinical pharmacists come into direct contact with patients on a daily basis.^[3] The task of every pharmacist working in a pharmacy should be to try to reduce the risk associated with the occurrence of nosocomial infections to a minimum, by taking preventive measures such as disinfection of hands and surfaces that come into contact with hands.

The results of microbiological smears in the laboratory during the day and after disinfection are presented in Table 3. Swabs were taken from the floor, table, scale, door and shelf. The total number of bacteria was detected in quantity 1 CFU on the table as well as on the shelf during the day in the laboratory. No coliform bacteria were present on the evaluated surfaces during the day in the laboratory. It was detected 1 CFU of TCB on the scale after disinfection. At the other sampling areas in the laboratory after disinfection, no numbers of monitored microorganisms were found.

Table 3: Results of microbiological swabss in the laboratory during the day and after disinfection.

Place od collection	MPA	EA	MPA	EA
	TCB	CB	TCB	CB
	During day	During day	After disinfection	After disinfection
Floor	0	0	0	0
Scale	1	0	0	0
Table	0	0	1	0
Door	0	0	0	0
Shelf	1	0	0	0

The provision of pharmaceutical care is also related to the requirements for microbial cleanliness of the pharmaceutical environment.^[7] Working in a pharmacy and in the production of pharmaceuticals requires an environment with minimal microbiological contamination. The microbiological quality of pharmaceutical preparations is influenced by the environment of their preparation and the material used. The presence of microorganisms in drugs and substances for pharmaceutical use can qualitatively and quantitatively affect the therapeutic activity of the drug and can have potentially adverse effects on the patient's health.^[1]

CONCLUSION

Currently, the demands on the hygienic-epidemiological regime in pharmaceutical and medical facilities are increasing. Employees of pharmaceutical facilities are exposed to various nosocomial infections. By disinfecting all surfaces in the pharmacy with which patients and employees come into contact, as well as personal hygiene, we can effectively prevent the transmission of infection. From the results of the microbiological swabs obtained after disinfection in the monitored parts of the pharmacy, we can conclude that the DisiClean Profi disinfectant used was effective enough in a 1 % concentration and a time exposure of 60 minutes.

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