

Effectiveness of Disinfection of Plastic and Wooden Floors in Rabbit Cages

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Abstract

The housing of rabbits is related to hygienic, behavioral, environmental and welfare aspects. Cleaning and disinfecting is imperative to maintain the wellbeing and health of animals. Thorough cleaning and adapted disinfection can help decrease the pathogen level and prevent or break the disease cycle. In this experiment we aimed on the efficacy of disinfection by using disinfectant SANDEZIA[®] in powder form applicative by scattering on the plastic or wooden floors of cages at a dose of 50g/m². Total count of bacteria, yeast, molds and coliform bacteria were collected from both type of floors of with microbiological swabs before and after disinfection. Disinfectant SANDEZIA[®] was effective on monitored floors where significant decrease of microorganisms, except molds was obtained. After disinfection we determined 6.3x10³ CFU of TCB (P<0.001); 0 CFU of CB (P<0.001); 0 CFU of yeasts (P<0.05) and 1.6x10³ CFU of molds on plastic floor. Results from wooden floor was 1.4x10³ CFU of TCB (P<0.05); 2.2x10¹ CFU of CB (P<0.05); 0 CFU of yeasts (P<0.001) and 3.6x10³ CFU of molds after disinfection. Presented results from the microbiological swabs represent decrease of microorganisms, in compare with numbers of CFU of microorganisms before disinfection which shows that tested disinfectant SANDEZIA[®] can be considered effective disinfectant against monitored microorganisms except molds.

Key Word: Disinfection; Disinfectant SANDEZIA[®]; Rabbit cages; Microbiological swabs

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I. Introduction

Most of the time, good hygiene is all that is needed to keep rabbits' environment healthy and prevent the spread of disease. Some sanitary and environmental arrangements are very helpful, including the application of biosecurity programs, the culling and removal of ill or dead animals, cleaning and disinfection of equipment, cages, instruments, insect traps on windows and ventilation intakes and avoiding wild rabbits entering the farm.^[1] Sanitation means the maintenance of environmental conditions conducive to health and well-being and involves bedding (as appropriate), cleaning, and disinfection. The goal of any sanitation program is to maintain sufficiently clean and dry bedding, adequate air quality, and clean cage surfaces and accessories.^[2]

Cleaning removes excessive amounts of excrement, dirt, and debris, and disinfection reduces or eliminates unacceptable concentrations of microorganisms. A pen should ideally be washed and disinfected (with an odorless disinfectant) at least every month.^[3] All bedding (hay, shavings, paper, straw, blankets), and litter soiled by urine and faeces should be removed and disposed of. All surfaces of the enclosure, hutch or room should be washed with washing up liquid and water first.^[4] After they are dry the surfaces should be wetted thoroughly with a suitable disinfectant. Potentially contaminated surfaces include: cage or run floor, walls, ceiling, door, and door latch, door handles, hay racks, water bottle clips, and any other cage furniture which cannot be removed. individual items that can be removed should be cleaned and then thoroughly wetted in the disinfectant.^[5]

Definition for disinfection is "a process which reduces the number of organisms present to a level where they do not pose a threat to health". The key to effective disinfection is good hygiene. Disinfection should not be carried out in the same room as the rabbits. Most disinfectants may cause irritation to the eyes, skin and if inhaled or ingested irritation to the respiratory or digestive system.^[6]

Halogen-containing disinfectants include chlorine, iodine, bromine and fluorine preparations, which are the most reactive and the most toxic of the halogen compounds. Halogen-containing compounds which are toxic

to the cell are created by the action of oxygen in the initial phase. The optimum pH for the disinfection effect is 5 - 8 and the presence of organic substances significantly reduces it. For practical disinfection, iodine, chlorine and its compounds are important.^[7]

The focus of the study was to analyze the effectiveness of disinfectant SANDEZIA[®] with active ingredient Tosylchloramide Sodium in the form of powder by using microbiological swabs on monitored floors in the rabbit cages and on the basis of obtained results to assess the level of hygiene.

II. Material And Methods

Breeding equipment and disinfection of cages

Microbiological swabs were taken from Small animal breeding club of University of Veterinary Medicine and Pharmacy in Kosice where large (over 5 kg) and medium (3.5 - 5.0 kg) breeds of rabbits are bred. In addition to rabbits, there are also 10 quails and 5 hens. The club has 2 rabbits houses with 9 and 12 boxes. Large breeds of rabbits are housed in cages measuring 80 x 60 cm, small breeds of rabbits are housed in cages measuring 60 x 60 cm. The hygienic level of floors from different materials - plastic and wooden (Figure 1) was analyzed.

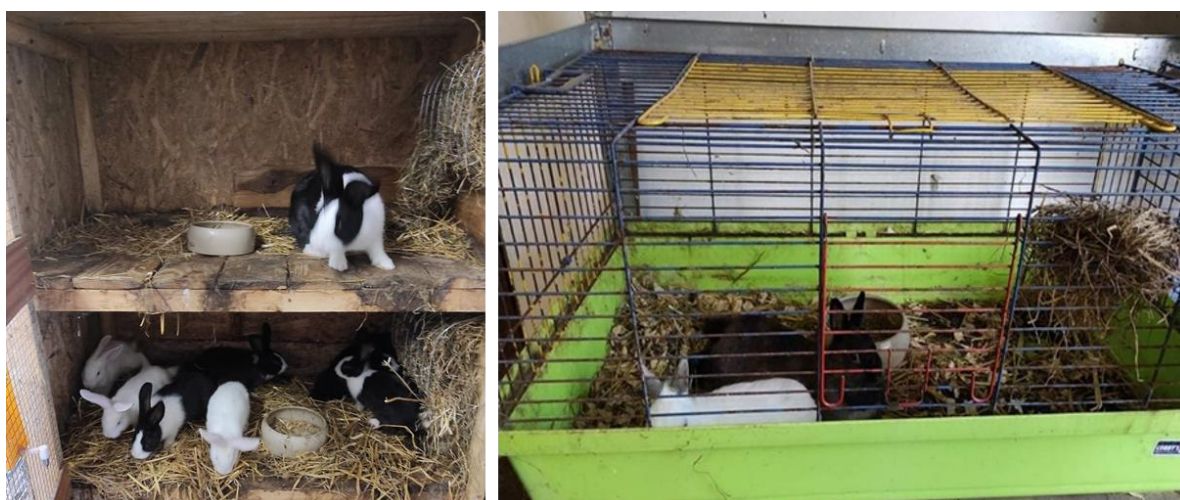


Fig. 1: Rabbits cages with plastic and wooden floor
Source: Foto by Zigo (2021)

Evaluated surfaces were mechanical cleaned before disinfection. For disinfection of evaluated surfaces was used disinfectant SANDEZIA[®] in powder form, without heating with exposure time 30 minutes applied by scattering on the floor at a dose of 50g/m². Disinfection can be carried out in the presence of animals. The disinfectant is composed of minerals, eucalyptus essential oil and the active ingredient is Tosylchloramide Sodium 0.25g / 100g. It works especially in damp rooms. It dries intensively wet bedding, preventing the conversion of urea into ammonia and the release of harmful gases. This product keeps the pH low, preventing the growth of pathogenic microorganisms. It reduces the number of diseases in a herd, the use of antibiotics and the costs of treatment. Moreover, in case of an infection, it supports the treatment. SANDEZIA[®] increases the content of nitrogen compounds in a stable or liquid manure that has a positive effect on crops increase when applying them as an organic fertilizer. Evaluated disinfectant prevents efficiently from *Salmonella Enteritidis*, *Escherichia coli*, *Staphylococcus aureus*, *Erysipelothrix rhusiopathiae*, *Streptococcus*, *Haemophilus influenzae*, *Botrytis cinerea*, *Coronavirus*, *Parvoviridae*, *Aspergillus*, *Chlamydiae*, *Clavibacter michiganensis*, *Pseudomonas*, *Pasteurella*, *Mycoplasma*, *Brucella*, *Listeria*.

Sample analysis

Sampling was performed with microbiological swabs before (after mechanical cleaning) and after disinfection from 2 types of floors – plastic and wooden. Each microbiological swab represented average value of 5 swabs taken from same place. The swabs were taken from area of 10 cm². ISO 18593 and ISO 21527 are standards for the method of sampling surfaces using swabs.^[8,9] Samples for microbiological analysis were taken with sterile cotton swabs using sterile templates, placed in a sterile tube containing 10 ml of sterile saline solution. From this mixture 0.1 ml was applied to the different agar plates. Endo agar (EA) was used for coliform bacteria (CB), Meat peptone agar (MPA) was used for total count of bacteria (TCB) and Sabouraud agar (SA) was used for yeasts and molds. The results from the Endo agar and Meat peptone agar were obtained after 24 hours incubation at 37 °C and the results from the Sabouraud agar were obtained after 5 days incubation at room temperature. Results were expressed in colony forming units (CFU).

Statistical analysis

The results were statistically processed using descriptive statistical analysis of data and statistical method of the Student's t-test. The differences in the numbers of total count of bacteria, coliform bacteria, molds and yeasts were calculated between condition before and after disinfection. The variables were described using mean (M). A level of 0.05 was considered significant (P).

III. Result and Discussion

Flooring material represents a critical point of sanitation. Undoubtedly, the flooring material is a key factor for rabbit comfort and cage hygiene. Floors, walls, and other surfaces require construction materials that are cleaned and maintained easily. The materials used should be smoothly surfaced, inert and resistant to dirt absorption.^[10]

Disinfectant SANDEZIA® was effective on monitored floors where significant decrease of microorganisms, except molds was obtained. After disinfection we determined 6.3×10^3 CFU of TCB ($P < 0.001$); 0 CFU of CB ($P < 0.001$); 0 CFU of yeasts ($P < 0.05$) and 1.6×10^3 CFU of molds on plastic floor. Results from wooden floor was 1.4×10^3 CFU of TCB ($P < 0.05$); 2.2×10^1 CFU of CB ($P < 0.05$); 0 CFU of yeasts ($P < 0.001$) and 3.6×10^3 CFU of molds after disinfection (Table 1).

We determined higher number of coliform bacteria from wooden floor in compare with plastic floor before disinfection, after mechanical cleaning, which agree with facts regards differences in mechanical cleaning according using material. In our study, after disinfection of wooden floor the counts of coliform bacteria did not exceed 10 % of their original counts (2.2×10^1 CFU/10 cm²), which can be considered a very good result of the disinfection efficiency. Our result agree with findings Ondrašovičová et al.^[11] who stated that the effectiveness of preventive disinfection is satisfactory if the number of indicator bacteria is up to 10% of the original number. Wooden floors will always be a challenge to fully disinfect as there are many cracks and crevices that can collect contagious material and they are difficult to clean and disinfect completely.

Under farming conditions, rabbits have been kept almost exclusively on wire-mesh flooring, which guaranteed good hygienic conditions due to the separation from their droppings. Wire cages have 2 main advantages: the animals can see all around them and they may also enable animals to communicate, not only by sight but by odors and urine spraying.^[12] Wire cages also provide good ventilation. Nevertheless, on wire floors, and in contrast with fattening rabbits, sore hocks (pododermatitis) are frequently observed in does. Ulcerative pododermatitis causes chronic pain and suffering^[13] as well as culling.^[14]

Plastic cages have come onto the market more recently. They are larger and the animals seem to lie out more on them, perhaps because plastic may feel warmer than metal. In general they are easy to clean, although with some designs, where the holes do not go right to the edge, there can be a build up of faeces in the corners.^[12] In the present study, after disinfection of plastic floor we detected no bacteria of CB and yeasts, but there were molds, and TCB after disinfection. After disinfection we observed 6.3×10^3 CFU of TCB per 10 cm², which represent statistically very significant decrease of total count of bacteria on the level which can be considered a very good result of the disinfection, but in the case molds we detected minimal decrease of microorganisms without statistical significance after disinfection, in compare with numbers of microorganisms before disinfection (Tab. 1). The use of a perforated plastic pad wedged on the wire is to be recommended when metal wire is used in the cage. We can choose between different materials for lying depending on room temperature and air velocity. The plastic pad must not obstruct the falling through of faecal drops and must be included in the cleaning and disinfection procedures.^[15] The raised floors consisting of artificial slats which replace the solid wooden floors represent changes which are made to improve hygiene.

Table 1: The Effectiveness of disinfectant SANDEZIA® on the monitored floors before and after disinfection

(CFUx10cm ²)	Plastic floors		Wooden floors	
	before	after	before	after
TCB	4.7×10^6	6.3×10^3	1.03×10^7	1.4×10^3
P value	$P = 0.002$		$P = 0.02$	
CB	1.02×10^4	0	9.2×10^5	2.2×10^1
P value	$P = 0.001$		$P = 0.03$	
Moulds	5.2×10^5	1.6×10^3	5.5×10^5	3.6×10^3
P value	$P = 0.05$		$P = 0.06$	
Yeasts	1.7×10^3	0	2.7×10^3	0
P value	$P = 0.003$		$P = 0.001$	

Note: CFU - colony forming units; TCB - total count of bacteria; CB - coliform bacteria; A level of 0.05 was considered significant (P).

Disinfectants used for veterinary hygiene purposes are an important tool to control animal pathogens in animal housing and transport, animal diseases prevention, production increase and improvement of the quality of animal products.^[16] Disinfectants used for veterinary hygiene may specifically be designed for the disinfection of floors, walls and ceilings of stables and vehicles, containers and cages for animal transport and animal housing.

Proper mechanical cleaning and disinfection of monitored floors with the right choice of effective disinfectant is very important. The evaluated results of microbiological swabs cultivation from monitored floors shows that the numbers of monitored microorganisms decreased on required level after disinfection which means that disinfectant was effective.

IV. Conclusion

Sanitation and disinfection are an important parts of any infection control plan. When plans are implemented properly, the introduction or spread of pathogenic organisms can, in most cases, be minimized or prevented. Disinfection with appropriate disinfectant is necessary to ensure a safe environment of rabbit hutches to prevent rabbit from infections.

The results of this study suggest that wooden floor represent a greater potential hazard for cross contamination than plastic floor. Based on our results, disinfectant SANDEZIA® using in the form of powder caused reduction of monitored microorganisms, except molds, on the level, which do not represent hygienic risk of microbial contamination for rabbits.

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