International Journal of Veterinary Science and Agriculture Research
Volume 6 Issue 4, November-December 2024
ISSN: 2582-4112, Available at www.ijvsar.com

Assessment of Hygiene Practices in a Bakery

MáriaVargová[1], Ewa Pecka Kielb[2], Jana Výrostková[3], František Zigo[4*]

[1]*Department of Public Veterinary Medicine and Animal Welfare, University of Veterinary Medicine and Pharmacy, Košice, Slovakia*

[2]*Department of Animal Physiology and Biostructure, Wroclaw University of Environmental and Life Sciences, Norwida 31, 50-375 Wroclaw, Poland*

[3]*Department of Food Hygiene, Technology and Safety, University of Veterinary Medicine and Pharmacy, Košice, Slovakia*

[4]*Department of Nutrition and Animal Husbandry, University of Veterinary Medicine and Pharmacy, Košice, Slovakia*

***For Correspondence**

Assoc. prof. DVM. FRANTIŠEK ZIGO, PhD.
Department of Nutrition and Animal Husbandry, University of Veterinary Medicine and Pharmacy, Košice, Slovakia

frantisek.zigo@uvlf.sk

Keywords: *disinfection, sanitation, Savo Original, bakery*

Abstract: *This study aimed to evaluate the effectiveness of disinfection by using microbiological swabs from various surfaces in the bakery production area, specifically from the bread-making and pastry sections, both before production and after disinfection. The disinfectant used was Savo Original at a 3% concentration, applied for a 30-minute exposure time. The results showed that disinfectant was effective on the evaluated surfacessuch as doors, floors, and walls, where no microorganisms were detected after disinfection. In the bread-making section, the surface of the table showed less than 1x10¹ CFU/10 cm² of total count of bacteria after disinfection. These findings indicate that the disinfectant was effective in eliminating the targeted microorganisms on the surfaces tested. Thorough sanitation, associated with appropriate mechanical cleaning and disinfection is the main prerequisite is the application of hygiene principles in the acquisition and production of health and hygienically safe food. In the case of lack of compliance with this assumption, primary or secondary contamination of food may occur and consequently put at risk the health of the consumer.*

I. INTRODUCTION

Food-borne diseases cause illness in millions of people worldwide every year. One way that food can be contaminated with pathogens is through direct contact with food-processing surfaces and equipment[1]. Bakery products are an important part of compensated diet, like many processed foods, are subject to chemical, physical, but also biological spoilage. Foodborne diseases are caused by contamination of food and occur at any stage of the food production, delivery and consumption chain. They can result from several forms of environmental contamination including pollution in water, soil, air, as well as unsafe food storage and processing [2].

Flour represents the most used ingredient of bakery products. It has been assessed that flour contains app. 8000 spores of mould in 1 gram of flour. Flour can be contaminated by moulds and yeasts (*Penicillium*,

Aspergillus, Rhizopus, Fusarium, Cladosporium), but also bacteria such as *Bacillus* species, *Pseudomonas, Streptococcus, Achromobacter, Flavobacterium, Micrococcus*. Other bakery ingredients can serve also as a source of microbial contamination[3].

Sanitation has principal position in food industry because the level of hygiene greatly influence food quality and safety. The most important tools for maintaining effective microbial control include minimizing the microbial load from outside sources to the process, efficient control of growth at microbiologically vulnerable sites and adequate mechanical cleaning and disinfection of all surfaces of process line[4]. Microbiological but also physical and chemical cleanliness is essential in food industry. Chemically clean surfaces are without undesirable chemical residues, and microbiologically clean surfaces imply freedom from spoilage microbes[5].Physical clean surfaces are surfaces with no visible waste or foreign matter on the equipment surfaces. The selection of disinfectant in the food processing plant depends on many factors, e. g.: the safety, rinsability and efficacy of the agent as well as corrosivity or the effect of the disinfectant on the sensory properties of the products manufactured[6]. Disinfectants accepted for use in the food industry are alcohols, chlorine-based compounds, quaternary ammonium compounds from surfactants, oxidants (peracetic acid, H_2O_2), persulfates and iodophors. The suitable disinfectant should be chosen based on each given process[7].

The aim of the work was to determine the effectiveness of disinfectant Savo Original in a 3% concentration by using microbiological swabs on monitored surfaces in the bakery operation and based on obtained results to evaluate the level of sanitation.

II. Materials and Methods

Microbiological swabs (n = 60) were collected in the bakery, from surfaces and equipment in the bread and pastry production section before production and after disinfection. The surfaces examined were the table, door, floor and wall as well as the surfaces of the hopper and conveyor belt.

Microbiological swabs were collected before production and after disinfection using sterile swabs from an area of 10 cm^2 transferred to 10 ml of sterile physiological solution. Subsequently, the suspension was inoculated onto nutrient agars in an amount of 0.1 ml. The plates were incubated in a thermostat, after incubation, the grown colonies were evaluated. Meat peptone agar (MPA) was used to determine the total count of bacteria (TCB) during 24 hours of cultivation at a temperature of 37±1 ºC. Endo agar (EA) was used to determine the number of coliform bacteria (CB) during 24 hours of cultivation at a temperature of 37±1 ºC. To determine the number of microscopic fungi (F), Sabouraud agar (SA) was used during 3 - 5 days of incubation at room temperature. The procedures were used according to valid ISO standards [8, 9, 10]. The detected species of microorganisms are expressed in CFU (colony forming units) numbers.

For disinfection of the monitored surfaces and equipment, the disinfectant Savo Original was used in 3% concentration, in liquid form, applied by spraying, without heating, with a contact time of 30 minutes. Savo Original is a cleaning and disinfectant that contains the active substance sodium hypochlorite ≥ 1 < 5%; sodium hydroxide ≥ 0.5 < 2% and < 5% anionic surfactant. The disinfectant is effective against broad-spectrum vegetative bacteria, as well as against fungi, *Mycobacterium, Poliovirus, Adenoviruses*, but also against *Bacillus subtilis.*

III. Results

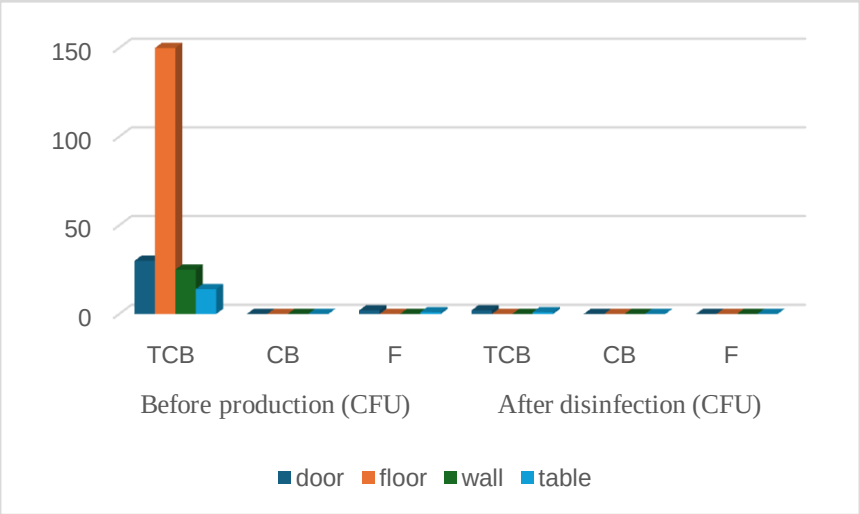
The present study was concerned with the assessment of the hygiene of the bakery environment based on microbiological swabs from individual surfaces. The subject of interest was the detection of the presence of TCB, CB, microscopic fungi before production and after disinfection. A total of 60 swabs were analyzed within the study, 10 swabs were taken from each investigated area (5 swabs before production and 5 swabs after disinfection). The average numbers of microorganisms from swabs from the monitored surfaces are recorded in Graphs 1,2.

Based on the results of Graph 1, it can be stated that the numbers of CFU/10 cm^2 after disinfection on the monitored surfaces meet the hygiene requirements and the obtained results indicate sufficient effectiveness

of the used product. The Savo Original disinfectant was effective on the floor, door and wall, where the condition after disinfection was 0 CFU/10 $cm^2$of TCB. On the table after disinfection was detected <$1x10^1$CFU/10 cm^2 of TCB.

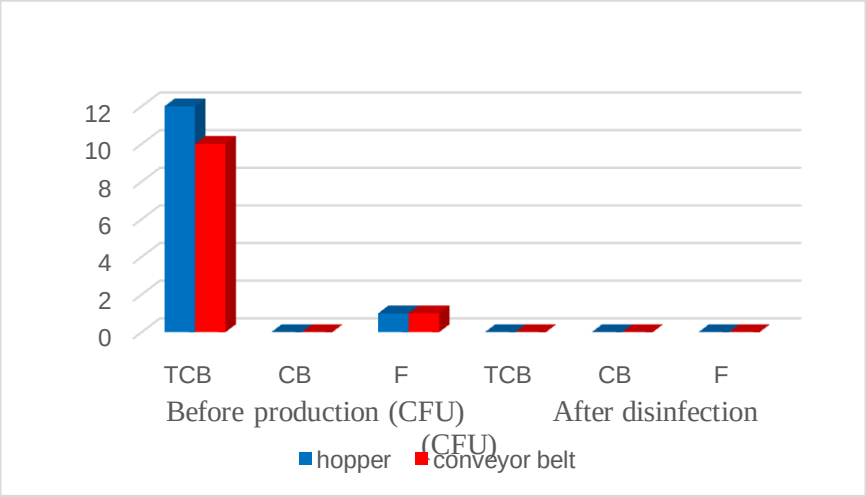
When evaluating the effectiveness of the disinfectant used on the surfaces of the equipment, we noted a decrease in the original contamination of the container surface ($1.2x10^1$ CFU/10 cm^2 of TCB) and the conveyor belt surface ($1x10^1$ CFU/10 cm^2 of TCB) to a value of 0 CFU/10 cm^2 (Graph 2), which indicates the sufficient effectiveness of the Savo Original.

Graph 1. Disinfection effect of Savo Original on monitored surfaces before production and after disinfection



Abbreviations: CFU – colony forming units, TCB – total count of bacteria, CB – coliform bacteria, F – microscopic fungi

Graph 2. Disinfection effect of Savo Original on equipment surfaces before production and after disinfection



Abbreviations: CFU – colony forming units, TCB – total count of bacteria, CB – coliform bacteria, F – microscopic fungi

IV. Discussion

Microorganisms found in the environment on individual surfaces as well as on the surfaces of production equipment are part of the microbial contamination of the finished product[11]. The cause of their occurrence may be insufficient mechanical cleaning and disinfection, biofilm formation and persistence of microorganisms in the environment. Biofilm represents a protective layer of microorganisms resistant to sanitation and disinfectants, which helps the persistence of unwanted microorganisms in the environment [12].

The main sources of primary contamination of raw materials are inadequate hygiene of the environment, production process, tools and equipment; insufficient personal hygiene of employees; secondary contamination and unsuitable storage conditions [13]. An insufficiently cleaned table indicates a possible risk of cross-contamination. If cleaning and disinfection are not sufficiently effective, it is necessary to pay attention to the suitability of the agent used, as well as the procedure for carrying out this activity [14].

Good hygienic design of bakery operations and equipment prevents product contamination and simplifies the process of mechanical cleaning of equipment surfaces. Hygienic design of technological equipment significantly contributes to reducing the risks of food contamination during production, as mechanical cleaning of these equipment is very difficult [3]. Microorganisms found on equipment surfaces can penetrate the raw material, therefore, early identification of potential sources of contamination ensures effective sanitation of the environment, thereby minimizing the risk of contamination of the raw material or the final product.

V. Conclusion

Due to fact that microorganisms are found in production areas, on individual surfaces and subsequently form part of the microbial contamination of the finished product, sanitation in the food industry has an important impact on the quality of food products as well as their shelf life. Based on the results we found, it can be stated that the disinfectant Savo Original, used in a 3% concentration was effective on the monitored surfaces, where the desired decrease in the number of monitored microorganisms occurred after disinfection.

VI. Acknowledgements

This study was supported by the Slovak Research and Development Agency under the Contract no. APVV-22-0457 (20%), SK-PL-23-0066 (30%), project VEGA 1-0162-23: Reduction in antibiotic use in dairy mastitis control programs (20%) and NAWA BPN/BSK/2023/1/00049 (30%).

References

[1] C. Dontorou, C. Papadopoulou, G. Filioussis,V. Economou, I. Apostolou, G. Zakkas. Isolation of *Escherichia coli* O157:H7 from foods in Greece. *International Journal of Food Microbiology*, 82, 2003, 273–279.

[2] C.D.E. Todd, J.D. Greig, Ch.A. Bartleson, B.S. Michaels. Outbreaks Where Food Workers Have Been Implicated in the Spread of Foodborne Disease. Part 6. Transmission and Survival of Pathogens in the Food Processing and Preparation Environment. *Journal of Food Protection*, 72, 1, 2009, 202–219.

[3] G. Wirtanen, S. Salo. Risk management by hygienic design and efficient sanitation programs 3rd seminar arranged by safoodnet – Food safety and hygiene networking within new member states and associated candidate countries; FP6-022808-2006 Tallinn, Estonia, May 4.-6. 2009. ISBN 978-951-38-7587-9.

[4] G. Wirtanen, M. Saarela, T. Mattila-Sandholm. Biofilms – Impact on hygiene in food industries. In: Bryers J (Ed.) Biofilms II: Process Analysis and Applications. John Wiley-Liss Inc., New York. 2000, 327–372.

[5] W.A.Gould. Current good manufacturing practices: Food Plant Sanitation. 2nd edn. CTI Publications, Inc., Baltimore, 1994, 189–215.

[6] B. Carpentier, O. Cerf. Biofilms and their consequences, with particular reference to hygiene in the food industry. *Journal of Applied Microbiology*, 75, 1993, 499–511.

[7] G. Wirtanen, S. Salo. Disinfection in food processing-efficacy testing of disinfectants. *Reviews in Environmental Science and Bio/Technology*,2, 2003, 293-306.
[8] ISO Standard 18593-2004: Microbiology of food and animal feeding stuffs: Horizontal methods for sampling techniques from surfaces using contact plates.
[9] ISO Standard 21527-2008: Microbiology of food and animal feeding stuffs: Horizontal method for the enumeration of yeasts and moulds.
[10] ISO Standard 4832-2006: Microbiology of food and animal feeding stuffs: Horizontal method or the enumeration of coliforms
[11] J. Čapla, P. Zajac, J. Golian, V. Vietoris.Biofilm formation on stainless steel surfaces in the food industry. *Potravinárstvo*, 3, 1, 2009, ISSN 1337-0960.
[12] M. Vargová, K. Veszelits Laktičová, R. Hromada, I. Cimboláková, I. Uher, I. Papajová. Sanitation and the environment. *Intechopen*. 2020, 190, ISBN 978-1-78985-528-9.
[13] J.A. Hennekinne, M.L. Buyser, S. Dragacci.*Staphylococcus aureus* and its food poisoning toxins: charakterization and outbreak investigation. *FEMS Microbiology Reviews*, 2012, 819-836.
[14] J. Golian. Sanitácia v poravinárstve. SPU Nitra, 2003.