**Original Paper**

# Evaluation of the hygienic condition of the slaughterhouse

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The food industry has an important role in the prevention of food borne illnesses. Contamination of food can occur in any stage of the production, storage and distribution. An essential part of keeping the products safe is food hygiene. The production process is complicated, changing the processes of production, preparation, and distribution, means there is more room for doubt about the hygienic status of the food. Slaughterhouses are primary production sites and their general hygiene requirements are set out in Regulation (EC) No 852/2004 and the commission regulation (EC) No 2023/2006. These regulations include the minimum rules for cleaning and sanitation of the production sites and requirements for education and training of personnel. Regulations must be followed by all businesses that produce food of animal origin. All levels of the production must operate under hygienic conditions in accordance with above mentioned regulations.The objective of this study was to determine the hygienic level of evaluated surfaces – stunning box, shower wall, floor and lift by microbiological swabs from room, where was perform slaughtering and bleeding. Microbiological swabs were taken before process of slaughtering and bleeding, during process and after disinfection. The swabs were taken from evaluated areas of 10 × 10 cm. The sampled areas were wiped by sterile cotton swabs, the swabs were 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 Meat peptone agar, Endo agar, Sabouraud agar. For disinfection of monitored surfaces in slaughterhouse was used disinfectant Virkon S in a 1% concentration which was effective on all monitored surfaces which was confirmed by statistical analysis. In conclusion, effective disinfection performed by suitable disinfectant in slaughterhouse is essential because it help to prevent the spread of many microorganisms which could cause seriuos consequences on health status of animal and human.

**Keywords:** microbiological swabs, disinfection, Virkon S, slaughterhouse, hygienic condition

## 1 Introduction

A slaughterhouse, also known as an abattoir, is a place where creatures are executed to give nourishment as in meat. According to Alonge (1991) slaughterhouse is a premise approved and registered by the controlling authority for hygienic slaughtering and inspection of animals, processing, effective preservation and storage of meat products for human consumption.To ensure production of meat products of good quality, slaughtering should be in slaughterhouses under veterinary supervision and complete hygienic measures (Serda et. al., 2015; Zailani et. al., 2016).

Fresh meat is easily contaminated with a variety of microorganisms and, if not properly handled and preserved, they support growth of spoilage and pathogenic species, leading to loss of quality and potential public health problems (Davies, 2000). Microorganisms are introduced through a variety of sources when the sterile muscles of healthy animals are exposed to the environment during slaughter, cutting and further handling.The main contamination sources of meat occurre during slaughtering processes such as gastro-intestinal tract content, hides of the slaughtered animals, but also staff and the work environment. Next sources of contamination of carcasses can be obtained during the slaughter process through the contact with the animal's skin, blood, hair, limbs, bile and

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stomach, gut contents, facilities, equipment, water supplies, air pollution and worker's hands and clothes (Muhammad et. al., 2012).

Cleaning and sanitation are an integral part of slaughtering and handling of meat and should already be taken into consideration at the planning and construction stage of slaughter facilities. Non compliace of hygiene practices in slaughterhouses poses a serious problem, which can increase food safety risks. In slaughterhouses, the risk posed is the highest given that meat is important in regards to foodborne illnesses. Level of hygiene practices may be influenced also by experience, profession and training of workers.

The aim of the work was to determine the effectiveness of disinfectant Virkon S which was used in a 1% concentration by using microbiological swabs on total count of bacteria, coliform bacteria and moulds found on monitored surfaces in the slaughterhouse and on the basis of obtained results to assess the level of hygiene.

## 2 Material and methods

### *2.1 Disinfectant*

The study was carried out in a small slaughterhouse situated in east of Slovakia (Figure 1). Evaluation of the sanitation was carried out by microbiological swabs. Disinfectant Virkon S, which was used for disinfection of surfaces, is a multi-purpose disinfectant balanced, stabilized blend of peroxygen compounds, surfactant, organic acids, and inorganic buffer. It contains oxone (potassium peroxymonosulfate, used as an oxidizing agent), sodium dodecylbenzene sulfonate (anionic surfactant), sulfamic acid, and inorganic buffers. Virkon S is recommended for use as a hard surface disinfectant in livestock production and transportation facilities. Disinfectant was in liquid form, applicated by spraying in 1% of concentration without heating, exposure time was 60 minutes. Swabs were taken from monitored places before and during slaughtering and bleeding and after disinfection.

**Figure 1** View into the area for stunning and bleeding

### *2.2 Sampling*

The swabs were taken from four places – stunning box, shower wall, floor and lift from area of 10 x 10 cm. From each place were taken 10 swabs, together were evaluated 40 samples. The sampled areas were wiped. Swabs were placed in a sterile tube which contained 10 ml of sterile saline solution. From this mixture 0.1 ml was applied to the different agar plates. Plates were incubated in thermostat, after incubation, the grown colonies were evaluated. For the evaluation of total count of bacteria, coliform bacteria and moulds, the procedure according to the applicable ISO standards was used. For coliform bacteria was used Endo agar, Meat peptone agar was used for total count of bacteria and for moulds was used Sabouraud agar (Figure 2). The results from Meat peptone agar Endo agar and were obtained after incubation at 37 °C during 24 hours The results from Sabouraud agar were obtained after 3–5 days incubation at room temperature. Results were statistically processed using descriptive statistical analysis of data.

 

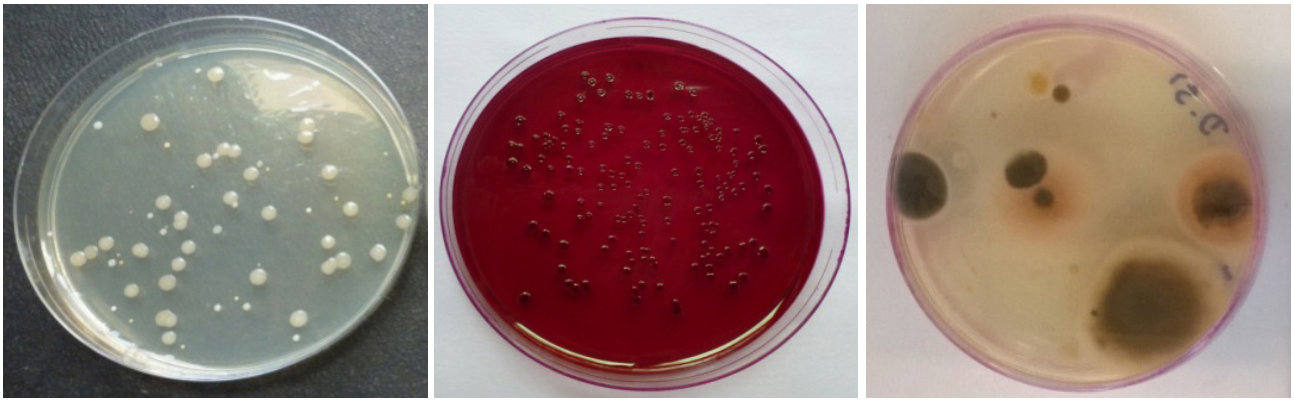

**Figure 2** Cultivation of microbiological swabs on Meat pepton agar Endo agar and Sabouraud agar

## 3 Results and discussion

Table 1 shows effect of disinfectant Virkon S which was used in 1% of concentration on the monitored surfaces in the room for stunig and bleeding before, during the process of slaughtering and bleeding and after disinfection.

**Table 1** Effect of disinfectant Virkon S on the monitored surfaces before, during the process of slaughtering and bleeding and after disinfection

| | The concentration of surface microorganisms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | before process | | | during process | | | after disinfection | | |
| | *n* = 10 | | | *n* = 10 | | | *n* = 10 | | |
| CFU | TCB | CB | moulds | TCB | CB | moulds | TCB | CB | moulds |
| M | 0.50 | 0.60 | 0.70 | 153.60 | 20.70 | 8.40 | 0.30 | 0.10 | 0.30 |
| *SD* | 0.71 | 0.70 | 1.06 | 49.88 | 9.28 | 4.97 | 0.32 | 0.48 | 0.48 |
| Min | 0.0 | 0.0 | 0.0 | 85.0 | 10.0 | 3.0 | 0.0 | 0.0 | 0.0 |
| Max | 2.0 | 2.0 | 3.0 | 240.0 | 39.0 | 20.0 | 1.0 | 1.0 | 1.0 |
| Median | 0.0 | 0.0 | 0.0 | 157.5 | 19.0 | 7.50 | 0.0 | 0.0 | 0.0 |

CFU – colony forming units, M – moulds, TCB – total count of bacteria, CB – coliform bacteria, M – mean, *SD* – standard deviation, Min – minimum, Max – Maximum

The microbiological quality of meat is strongly influenced by the conditions of hygiene prevailing during their production and handling. Coliform bacteria counts allow to verify hygiene-related problems and contamination of fecal origin. Their high counts are usually associated with significant levels of enteric pathogens (Eisel et al., 1997; Gill et al., 1996). Mold counts have serve as indicators of sanitary quality in food processing plants, since molds can grow rapidly on rests of food adhering to surfaces, thus representing a possible source of contamination. Several molds can represent risk to animal and human health because of their production of toxic metabolites such as mycotoxins (Dillon, 1998). Total count of bacteria counts provide an estimation of the total microbial population, and their high levels are usually correlated to low quality of the environment of food processing plant (Jay, 2005).

Without proper hygienic control, the environment in slaughterhouses can act as an important source of microbiological contamination. To reduce the possibility of microorganisms to survive by means such as biofilm, the cleaning and disinfection should, at a minimum, be able to obtain a reduction in microorganisms that is equal to the daily accumulation, and to eliminate pathogens that are introduced (Møretrø and Langsrud, 2017). The bacteria found after disinfection are more resistant and can represent potential food safety or food spoilage issue. Resistance can develop over time if small amounts of disinfection is left on the surfaces which leads to selective pressure (Langsrud et al., 2003).

According result from the microbiological swabs taken from the monitored room for stunnig and bleeding of slaughterhouse we can mark disinfectant Virkon S in 1% of concentration as effective disinfectant for reduction the

amount of microorganisms in the slaughterhouse to the level which doesn´t represent heath threat and in this way disinfectant Virkon S is able to ensure suitable hygienic level.

## 4 Conclusions

Meat hygiene is a complex activity. Hygienic slaughter and dressing operations, in conjunction with veterinary ante-mortem and post-mortem inspection, are essential in minimising the risk of contaminating meat with pathogenic organisms. Irrespective of the scale and complexity of the business, there is an absolute duty on the management and staff to ensure that they produce safe food, which is suitable in every way for its intended end use.

Control of pathogenic microorganisms on surfaces is based on the approaches of minimizing surface contamination through proper sanitation, and application of decontaminating procedures.

We we confirmed that the disinfectant Virkon S used in 1% concentration during exposure time was effective against total count of bacteria, coliform bacteria and against moulds. This results about the main points of microbiological contamination in the slaughterhouse is expected to aid professionals responsible for hygiene in similar establishments to set up proper hygienic procedures for prevention or reduction microbiological contamination of meat and meat products.

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