

COMPARISON OF TWO CONTROL METHODS OF DISINFECTION IN A POULTRY SLAUGHTERHOUSE

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Introduction

The directive of the WHO and the FAO recommends, today, the recourse to HACCP principles for the control of the microbiological quality of the intended foods to human consumption. One of the most important parameters intervening in the biosecurity of slaughterhouses is the cleaning and disinfection procedure applied to different sectors of the slaughterhouse. It is according to the personnel qualification and the use of cleaning and disinfection procedures that will depend on the hygienic statute of the slaughterhouse, but also the quality of the poultry meat during slaughtering and packaging. A badly made decontamination will permit the contamination of poultry carcasses and the butcher's by micro-organisms that can be pathogenic (salmonella, listeria, campylobacter..) and harmful to the public health. It is therefore necessary to control the cleaning and the disinfection to identify the risk points that are susceptible to be to the origin of meat products contamination. The technical means of control are various (swabbing, ATPmetry, petri dish contact.) and permit to complete the operator's visual observations.

The objective of this study is to evaluate two control methods of cleaning and disinfection, the first based on the utilization of petri dish contact, type Rodac PCA[®], the second, Kit PRO 3S[®] permitting to detect the microbial proteins on the tested surfaces.

Material and methods

A study concerning the technical validity of two control methods of cleaning and disinfection in Batna's poultry slaughterhouse has been realized to verify their reliability. The first method is based on the counting of total germ colonies thanks to petri dish contact of 25 cm² (Rodac PCA[®]) used on different surfaces of the slaughterhouse sectors (quay of reception, slaughtering room, evisceration room, meats ...). The second method (Kit PRO 3S[®]) permits to put in evidence the presence of dirty on a visibly clean surface, it is based on the detection of bacterial proteins ($\mu\text{g}/\text{test}$) on the different surfaces inside the slaughterhouse (soil, wall, scale, chain, blood tray, drier, carpet...).

After cleaning to the warm water (32°C) added of a non ionic detergent (0.1% ISIS[®]), under pressure (30 bars) and a disinfection to the Biocid 30[®] (0.25%); 10 petri dish contact (Rodac PCA[®]) have been used to value quantitatively the number of total germs taken at random on every surface of different places of the slaughterhouse sector, either a total of 180 samples for all the slaughterhouse.

The reading of the colonies number is done after 36 hours of incubation to 37°C for the petri dish contact. According to the number of colonies counted, a classification is done in function of the obtained result (Table 1) (Vindevogel, 2000).

Table 1: Class of control after N/D of surfaces (CFU/25 cm²) (Vindevogel, 2000)

Class	0	1	2	3	4
UFC	0<CFU<2	3<CFU<9	10<CFU<29	29<CFU<90	>90

So a mean of classes for every surface studied in the slaughterhouse will be established on all the results in order to appreciate the efficiency of cleaning and disinfection (Table 2).

Table 2 : Means appreciation of control classes after N/D of surfaces (Vindevogel, 2000)

Class	1 (very good)	2 (good)	3 (satisfactory)	4 (medium)	5 (bad)	6 (very bad)
x	< 0.5	0.5-1	1.1- 1.5	1.6- 2.0	2.1 – 2.5	> 2.5

For the Kit PRO 3S, the principle consists in swabbing on a surface of 10 cm² after to have humidify the swab in the test tube, the swab is dived then in the test tube full of reagent. After 10 minutes, one pours with a count drips in the test tube the revealing solution. In presence of proteins, the colour immediately changes to blue. The level of surface cleanliness is determined thanks to the assessment scale (fig.1). For every test, a kit of 30 tests is used.

Figure 1: Evolution grid Kit PRO 3S[®]



Results

The results presented in the table 3, demonstrate that the control of the disinfection by petri dish contact Rodac PCA[®] on the different surfaces tested of the slaughterhouse, present a variable CFU number according to the sector. In the reception quay, it is the soil that present the biggest contamination after N/D (41-70 cfu/25 cm²) with regard to the wall and soil. The slaughtering room is the most polluted, the CFU number is especially important in the

slaughtering chain (59-85 cfu/25 cm²). In the evisceration room, the contamination is very weak, the most elevated values are noted in the eviscerator (6-12 cfu/25cm²).

In the meat room, trucks present 44-52 cfu/25 cm², then the contamination of the carpet (8-10 cfu/cm²) and of the various instruments (13-22 cfu/25 cm²) is weak with regard to the one of trucks. The comparison of the obtained results by petri dish contact (Rodac PCA[®]) with the Kit Pro 3S permits to give an appreciation of the N/D. Indeed if in theory a surface containing 10-20 cfu/25 cm² corresponds to 10 µgs of bacterial proteins, the results obtained by the Kit Pro 3S are compliant for all surfaces tested except for the eviscerator (6-12 cfu for 50 µgs of bacterial proteins) and of the various instruments used in meats product (13-22 cfu for 0 µgs of proteins). Statistically, the increase of the number of cfu with regard to the bacterial protein rate expressed in µg gives a correlation coefficient $r^2 = 0.67$. It is a positive correlation.

In order to appreciate the procedures of cleaning and disinfection in the slaughterhouse, a classification in function to the number of cfu permits to determine if surfaces are well disinfected or no. The note obtained thanks to the mean of classes for every studied surface in the slaughterhouse is established on the whole of the results in order to appreciate the efficiency of the N/D (Table 4). Only the slaughtering chain is considered bad disinfected with a rate of cfu/25 cm² between 30 and 90 and a note of 2.1 (class 3). All the other results are considered acceptable and the surfaces of the different places don't require a second disinfection.

Discussion

The control measures of cleaning and decontamination efficiency in the insurance systems of animal products quality are various. It is important to determine their reliability, notably in the case of HACCP method utilization (Collin, 1993). The method of control of the disinfection looked for must be fast. Indeed, all information on a bad quality of disinfection would lead a nonconformity of the slaughterhouse and therefore the product can have risks.

The use of a fast method as the Kit Pro 3S can inform us on the hygienic statute of the slaughterhouse, but in case of contamination of the environment by pathogenic germs (listeria, salmonella, campylobacter), this method remains subjective (Salvat, 1994).

For that, several levels of validation and optimization can be envisaged:

- all three days a test Kit Pros 3S can be realized on surfaces « tests » or an ATP-metric measure more close of the microbiological reality.

- Once per week, the petri dish contact will be analyzed and the result will be put in correlation with the previous method and the operator's observation.

Salvat and al 1995 recommend the association of a fast method with a method of swabbing to well appreciate hygiene in slaughterhouses.

References

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Table 3. Appreciations of different surface tested in the slaughterhouse after N/D

Sector	Tested surface (n=150)	Petri dish Rodac PCA (CFU/25 cm ²)	Kit Pro. 3S (g proteins/test)
Quay of reception (n = 30)	scale	20-32	10
	Soil	41-70	25
	Wall	7-24	25
Slaughtering room (n=50)	Slaughtering chain	59-85	50
	Blood tray	6-16	10
	Warm bath	20-27	10
	Soil	60-76 8-21	25 25
Evisceration room (n=40)	Drier	0-2	10
	Eviscerator	6-12*	50*
	Crop out cleaner	0-3 1-4	10 10
	Meat products (n=30)	Carpet	8-10
Truck		44-52	25
Various instruments		13-22	0

Table 4. Classes of controls after N/D of slaughterhouse surfaces

Class	0	1	2	3	4
CFU	0 < CFU < 2	3 < CFU < 9	10 < CFU < 29	30 < CFU < 90	> 90
Surfaces	Drier Crop out Cleaner	Wall Blood tray Soil (slaughtering room) Eviscerator Carpet	Feathery Various instruments Scale Soil (quay of reception) Warm bath Truck	Slaughtering chain	
Note	0.3 (very good)	0.8 (satisfying)	1.4 (medium)	2.1 (bad)	-very bad