Proposition of microbiological criteria for the quality control of faecal contamination in Belgian slaughterhouses and cutting rooms

G. Daube[1], Y. Ghafir[1], JM. Dumont[2], JY. Francois[1], M. Cornelis[4], M. Jouret[4] and L. De Zutter[3]

[1] *Food Microbiology, Faculty of Veterinary Medicine, University of Liege, Liege, Belgium*
[2] *Public Health Institute - Louis Pasteur, Brussels, Belgium*
[3] *Food Microbiology, Faculty of Veterinary Medicine, University of Gent, Gent, Belgium*
[4] *Institute of Veterinary Expertise (Public Health), Brussels, Belgium*

Introduction

- The faecal contamination is likely the main source of potential human pathogens including *Salmonella*, *Campylobacter* and enterohemorrhagic *Escherichia coli* on animal carcasses and on meat. Leakage from the gastrointestinal tract or contact with the animal skin could cause widespread contamination. In warm-blooded animals, the best indication of faecal contamination is *Escherichia coli* numbering. This microorganism is widely present in the gastrointestinal tract and survives under refrigerated conditions but temperatures below 7°C prevent its growth.
- The USDA has chosen *E. coli* as indicator of faecal contamination and the enumeration has to be done mandatory for all industries commercializing meat in the United States of America.
- The Belgian surveillance of meat in 1998 has allowed the evaluation of the sampling method and criteria for the Belgian production surveillance are proposed.

Material and Methods

- In 1998, the Belgian surveillance program has assessed the contamination with *E. coli* of meat from beef, pork, layers, broilers and turkeys.
- The sampled matrixes are described in Table 1.
- The enumeration of *E. coli* has been realised on the chromogenic Rapid *E. coli* 2 medium (Sanofi Diagnostics Pasteur, France) after an incubation of 24 hours at 44°C.

Table 1: Matrixes investigated

Origin	Matrixes	Sampling quantities	Results expressed in
Beef	Carcass	400cm ^{2}	cfu/cm ^{2}
Pork	Carcass	600cm ^{2}	cfu/cm ^{2}
	Liver	600cm ^{2}	cfu/cm ^{2}
	Retail cuts	25g	cfu/g
	Minced meat	25g	cfu/g
Broilers	Carcass (skin)	25g	cfu/g
	Liver	25g	cfu/g
	Boneless breast	25g	cfu/g
Layers	Carcass (skin)	25g	cfu/g
Turkeys	Carcass (skin)	25g	cfu/g

Results and discussion

The results of the enumeration of *E. coli are presented in figure 1-10.*

Figure 1: Beef carcasses

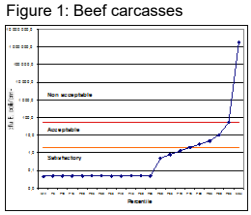


Figure 2: Pork carcasses

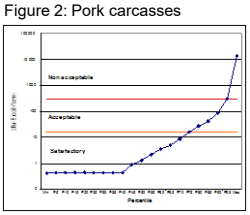


Figure 3: Pork liver

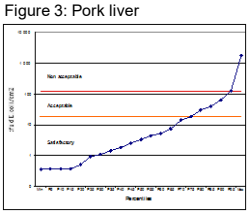


Figure 4: Pork retail cuts

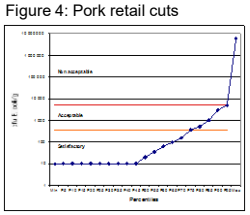


Figure 4: Pork minced meat

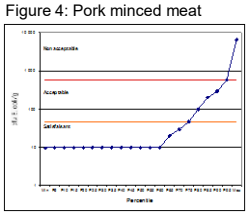


Figure 6: Broilers carcass

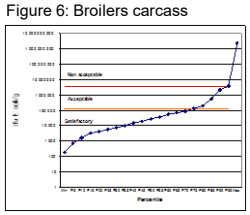


Figure 7: Broilers liver

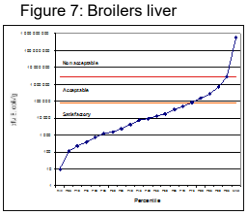


Figure 8: Broilers boneless breast

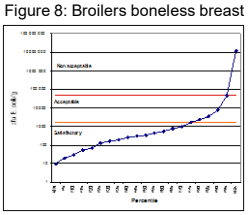


Figure 9: Layers carcasses

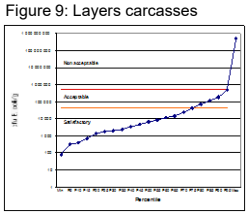
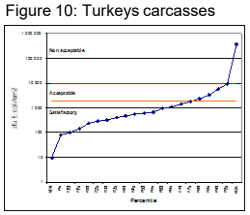


Figure 10: Turkeys carcasses



After critical analysis of the results, the following criteria (Table 2) could be proposed :
- The satisfactory limit (=3m) correspond to the percentile 75 level and the acceptability limit (M) to the 95 percentile.
- Interpretation must be done on the last 5 (=n) assayed samples and only 1 sample on 5 is tolerated between the satisfactory and the acceptability limits and none above the acceptability level.
- If the criteria were not encountered, new hygienic measures must be performed in order to obtain conform analytical results.

In pork, a correlation may be described between the presence of pathogens (especially *Salmonella*) and the enumeration of *E. coli* (Figure 11). In poultry, the prevalence of pathogens and the *E. coli* level are too high to establish a relationship really useful in order to protect Public Health (Figure 12). However, *E. coli* enumeration is a good mean in order to evaluate hygienic measure efficacy in all meat industry.

Table 2: Microbiological criteria

	Beef carcass	Pork carcass	Pork liver	Pork retail cuts	Pork ground meat
3m	3	15	21	$3,6.10^2$	48
M	50	$3,0.10^2$	$1,5.10^2$	$5,0.10^3$	$6,0.10^2$
	Broilers skin	Broilers liver	Broilers breast	Layers skin	Turkeys skin
3m	$1,2.10^5$	$9,0.10^4$	$1,8.10^3$	$4,5.10^4$	$1,8.10^3$
M	$4,0.10^6$	3.10^5	$4,5.10^3$	$5,0.10^5$	$9,0.10^3$

Figure 11: Enumeration of *E. coli* in positive and

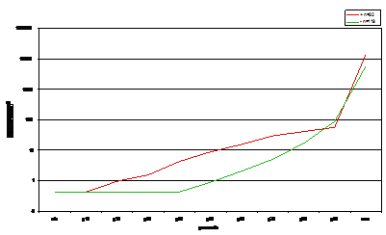
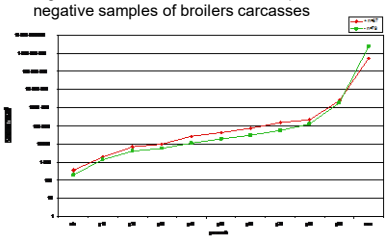


Figure 12: Enumeration of *E. coli* in positive and negative samples of broilers carcasses



Conclusion

These criteria are proposed for internal quality control. They will allow an evaluation of the normal contamination rate of the industry, in excluding the accidental contaminations. These criteria must be regularly reevaluated.

Bibliography

Food Safety and Inspection Service (FSIS), Federal Register of Department of Agriculture, FSIS, Part II, 9CFR Part 304 Pathogen reduction; HACCP Systems; Final rules, partim pages 38846-38848.

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