EVALUATION OF TURKEY MEAT HIGIENIC QUALITY THROUGH RAPID TESTS

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Background

Microbiological contamination of food is a problem that threats the safety of consumer. Classic microbiological methods are laborious and give slow answers which is a disadvantage when the principal aim is to assess and avoid the commercialisation of food products not acceptable and assure the microbial food safety. The demand from Industry to the development of new methods with high automatisation and rapid answers has grown up in the last twenty years (PATEL,1994)

Poultry meat has became one of the most popular meat in men diet, so is very important to control the microbial quality of meat to commercialization and assure its safety for consumers. The rapid microbial methods commercialized seem to be a good tool to achive these objectives.

Objectives

1) To evaluate four different microbiological rapid methods -Petrilfilm *Enterobacteriaceae* Count Plate (3M) / Petrifilm Select *E. coli* Count Plate (3M) / VIP *Listeria* (Biocontrol 1001147, USA) / VIP *Salmonela* (Biocontrol 1101269, USA) – in turkey meat, comparing them with the respective standard culture methods.

2) To compare the microbiologic contamination level of turkey carcasses with the microbiologic contamination level of sliced turkey meat taking into account the above mentioned tests, and analysing the existence of cross contamination during deboning of turkey carcasses.

Materials and methods

The samples used in this study were collected from a commercial processing plant during a four months period. Twenty-four turkey carcasses and twelve samples of sliced turkey meat were analysed. The chosen turkey carcasses were male, belonging to But 9 and Big 6 flocks. Asseptíc samples of carcasses surface were made in the way out of the chilling tunnel (-2ºC / 2 m.s-1 / 90% H.R.), using a swab tip in 25 cm^2 of the breast area *Pectoralis muscle.* After deboning the analysed carcasses, sliced turkey meat was collected.

Microbial analyses were performed in the thirty-six samples colected. *Enterobacteriaceae* counting was made by Petrifilm *Enterobacteriaceae* Count Plate and by the standard method (Norma Portuguesa 4137/1991); *Escherichia coli* counts was performed by Petrifilm Select *E.coli* (SEC) Count Plate and by standard methods (Norma Portuguesa 4396/2000).

The detection of *Listeria spp* was made by Visual Immunoprecipitate Assay for *Listeria* – VIP *Listeria*- (Biocontrol 1001147, USA) and by procedures described on ISO/DIS 11290-1. In both methods, biochemical confirmation was made in API *Listeria* galeries (BioMerieux 10300); the detection of *Salmonella spp* was made by Visual Immunoprecipitate Assay for *Salmonella* - VIP *Salmonella*- (Biocontrol 1101269, USA) and by procedures described in Norma Portuguesa 1933. Biochemical identification was made by API 20E galeries (BioMerieux 20100).

Inoculation essays in turkey meat were performed with *Listeria monocytogenes* 4a and *Salmonella* Enteritidis CECT 4300, as positive controls. On inoculation essays two levels of contamination, 1-5 cfu/25g and 10-50 cfu/25g have been done, on 25g of sliced turkey meat.

Statistical analysis: Linear regression analysis and correlation coefficient were used comparing Petrifilm Count Plates with standard methods. McNemar method ($X2<3,84$ at $P<0,05$) was used to compare standard methods detection of *Listeria spp* and *Salmonella spp* with VIP *Listeria* and VIP *Salmonella* respectively.

Results and discussion

On carcasses the mean *Enterobacteriaceae* counts by standard methods and Petrifilm *Enterobacteriaceae* Count Plate, were respectively 8,3 cfu/cm^2 and 6,9 cfu/cm^2 (Figure 1). On sliced turkey meat the counts were 5,6 x 10^2 cfu/g and 5,6 x 10^2 cfu/g in both methods. The *E.coli* counts (Figure 2) on carcasses were 1,3 cfu/cm^2 by standard methods and 1,2 cfu/cm^2 by Petrifilm Select *E.coli* Count Plate; on sliced meat were 7,9 cfu/g and 9,5 cfu/g by standard methods and petrifilm respectively.

Petrifilm *Enterobacteriaceae* and Petrifilm *E.coli* count plates showed good correlation coefficients with standard methods: a) Petri *Enterobacteriaceae* had an r=0,95 in carcasses and a r=0,96 in meat; b) In Petri *E.coli* essays an r= 0,96 in carcasses and r= 0,95 in meat were obtained.

Listeria spp were not detected on turkey carcasses sampled but was present in 58,3% of the turkey meat samples (25% *Listeria monocytogenes*, 16,6% *L.innocua*, 8,3% *L.seeligeri* and 8,3% *L.seeligeri / L.ivanovii*). Table 1 shows the data obtained comparing VIP *Listeria* method and standard method: $\chi^2<0,25$, a sensitivity > 59%, a specificity > 71,4% and an agreement between the two methods >69,2%. These results are similar to those obtained in validation assays of VIP *Listeria* done by FELDSINE (1997).

Salmonella spp were not detected from any sample of turkey carcasses or sliced turkey meat. In inoculation assays, the results obteined to VIP *Salmonella* kit were $\chi^2<0,25$, a sensitivity> 75%, a specificity> 71,43% with an agreement between the two methods >73,3% (Table 2), in agreement with the results refered by FELDSINE (2000).

Conclusions

The results suggest that Petrifilm *Enterobacteriaceae* Count Plate and Petrifilm Select *E. coli* Count Plate are similar to the respective standard methods in the analyse of the surface of turkey carcasses and of turkey meat. The results showed that the VIP *Listeria* and VIP *Salmonella* tests are similar to the respective standard methods in the detection of *Listeria spp* and *Salmonella enteritidis* in turkey meat. Industryal technicians on turkey meat quality control can currently use these methods.

A higher percentage of *Listeria spp.* detection in meat compared with detection on carcasses suggest a high cross contamination on deboning operation or a different sensitivity from collecting methods. *L. monocytogenes* was the prevailing *Listeria* specie in turkey meat.

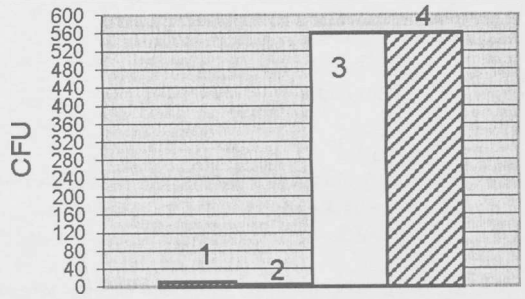

Figure 1: *Enterobactereaceae* counts obtained in turkey carcassses and in sliced turkey meat by standard methods and Petrifilm (Petr) (1- Standard method in carcasses (cfu/cm^2); 2- Petr. in carcasses (cfu/cm^2); 3- Standard method in sliced meat (cfu/g); 4- Petr in sliced meat (cfu/g))

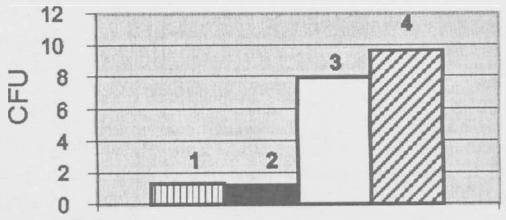

Figure 2: *Escherichia coli* counts obtained in turkey carcassses and in sliced turkey meat by standard methods and Petrifilm (Petr)
(1- Standard method in carcasses (cfu/cm^2); 2- Petr. in carcasses (cfu/cm^2); 3- Standard method in sliced meat (cfu/g); 4- Petr in sliced meat (cfu/g))

Table 1: Detection of *Listeria spp* in turkey meat by VIP *Listeria.*

	Sensitivity	Specificity	Agreement	χ^2
Meat sample	85.71%	100%	91.67%	0
High inoc. Level	87.5%	_	87.5%	0
Low inoc. Level	50%	71.4%	69.2%	0.25
Meat sample + low inoc. Level.	76.9%	83.3%	80%	0
Uninoculated	_	100%	100%	-

Table 2: Detection of *Salmonella spp* in turkey meat by VIP *Salmonella.*

	Sensitivity	Specificity	Agreement	χ^2
High inoc. Level	100%	-	90.9%	0
Low inoc. Level	75%	71.43%	73.3%	0.25
Uninoculated	_	100%	100%	-

References

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