

MICROBIOLOGICAL CHARACTERISTICS OF POULTRY MEATS-RESULTS OF INSPECTIONS CARRIED OUT IN THE PROVINCE OF MILAN

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Riassunto: Sono stati esaminati, sotto il profilo microbiologico quali/quantitativo (C.B.T., Coliformi, *E. coli*, *S. aureus*, Clostridi solfito-riduttori, *B. cereus*, *Salmonella* spp. e *Listeria* spp. e *Campylobacter* spp.), 240 campioni di carni avicole (pollo, tacchino e quaglia) conferite ufficialmente in base alle norme previste dal Piano regionale di programmazione e coordinamento degli interventi in materia di controllo ufficiale dei prodotti di origine animale della Lombardia e da alcune aziende private per autocontrollo. La CBT è risultata sempre bassa ed in linea con quanto riportato in bibliografia così come è avvenuto anche per i coliformi, *E. coli*, *S. aureus*, Clostridi solfito riduttori e *B. cereus*. Per quanto riguarda *Salmonella* spp., solo 5 campioni sono risultati positivi: uno a *S. typhimurium* e uno a *S. enteritidis* (pollo), un solo campione di tacchino è risultato positivo a *S. blokley* e due di quaglia su cinque campioni analizzati sono risultati positivi a *S. typhimurium*. Circa il 3% dei campioni analizzati è risultato positivo a *Listeria monocitogenes* ma entro i limiti di legge. La ricerca dei *Campylobacter* termofili ha interessato solo 50 campioni e solo 5 sono risultati positivi. Questi risultati confermano l'elevata qualità igienico-sanitaria delle carni avicole, in accordo a quanto riportato nella bibliografia nazionale e nel rispetto delle norme comunitarie.

Key words: pollo, tacchino, carne, cariche microbiche

Summary: Under the qualitative/quantitative microbiological profile (C.B.T., Coliforms, *E. coli*, *S. aureus*, Sulphate-reducing Clostrides, *B. cereus*, *Salmonella* spp. and *Listeria* spp. and *Campylobacter* spp.), 240 samples of poultry meat (chicken, turkey and quail) were examined and officially considered according to the norms envisioned by the regional plan of the programming and co-ordinating of operations concerning official inspections of Lombardy animal origin and from a few private industries for self-inspection. The CBT always turned out to be less and in line with that reported in the bibliography, as is also the case with coliforms, *E. coli*, *S. aureus*, sulphate reducing Clostrides and *B. cereus*. As for *Salmonella* spp., only 5 samples have turned out positive: one for *S. typhimurium* and one for *S. enteritidis* (chicken); only one sample from turkey has turned out positive for *S. blokley*, and two out of five samples analysed from quail have been positive for *S. typhimurium*. About 3% of the samples



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analyzed have turned out positive for *Listeria monocitogenes*, but within the limits of the law. Research on *Campylobacter* thermophiles has involved only 50 samples, of which only 5 have resulted positive. These results confirm the high quality of hygiene and cleanliness of poultry meat, in agreement with that reported in the national bibliography and with respect to EU norms.

Key words: poultry, meat, microbiology quality

Introduction

The recent crises which have hit the meat food department (dioxins, avian flu, BSE, etc.), have provoked notable repercussions on consumption and have highlighted the fact that public opinion is today more attentive and sensitive than in the past, relative to the problems connected to the hygiene/sanitation aspects of the origins of animal food and of the technologies of animal farming (Pignatelli 2002). This evolution has induced the European Commission to consider as a strategic priority the achievement of the highest possible standards for food safety. Over the years this legislation has grown and become more specific, extending even to all industrial and handicraft activities concerning foods and the obligation to develop a programme of self-inspection, and it has also indicated a system with which to refer for its implementation (EU directive 43/93/CEE "hygiene of food products", received in Italy with the Legislative Decree of 26 May 1997, No. 155). Apart from specific norms on food hygiene, the legislative evolution at the Community level, to the end of major contribution to public health protection, has also taken into consideration zoonotic, or potentially so, agents. To that end the formulation of the (CE) Regulation No. 99/2003 concerning the "measures of surveillance of zoonotic and zoonotic agents" was reached and the (CE) Regulation No. 2160/2003 "on the control of salmonella and other specific zoonotic agents present in foods". Moreover, the (CE) Regulation No. 2073/2005 of 15 November 2005, attachment I, sets the criteria for safety relative to the microbiological load of food products, in particular as far as the presence of pathogenic micro-organisms are concerned. This regulation, apart from stabilising microbiological criteria, sets the norms for implementation which the operators in the food sector must respect with regard to the applications of general and specific hygienic measures (art. 4 of the CE Regulation No. 852/2004). Coming into effect the 1st of January 2006, the CE Regulation No. 2073/2005 harmonizes on a European level the microbiological criteria, prior to then defined autonomously by individual Member States, applicable to the food produced and in free circulation within the Common Market. The aim of the present research has been to evaluate the microbe contamination of samples of poultry meat and of the related products deriving from them, consigned to the Local Health Organisation, and from private farms for self-inspection in the Province of Milan.

Material and Methods

The research was carried out at the laboratories of food Microbiology at the headquarters in Milan at the Istituto Zooprofilattico of Lombardy and Emilia Romagna in the years from 2005-2008, and it has taken into consideration the consignment of meat and raw products of the ASL, conducted according to the "Regional plan of programming and coordination of interventions relating to official control of products originating from animals" edited by the General Management of Health for the

Lombardy Region and by the individual companies for self-inspection.

The microbiological analyses that were executed, of a qualitative and quantitative type, were conducted following the methodology set forth by Zavanella (2000) and accredited laboratory methodology and, when required by regulation, the ISO methods set forth in Regulation CE No. 2073/2005.

QUANTITATIVE ANALYSES

In the quantitative microbe research the following bacteria were searched for, expressed in UFC/g of the sample: total microbial count, Coliforms, *E. coli*, *S. aureus*, Faecal Streptococci, Sulphate-reducing Clostrides, anaerobes and *B. cereus*. The quantitative research for *Listeria* was effectuated solely in the event of a positive result from the qualitative research.

QUALITATIVE ANALYSES

For this type of analysis, with the entry in force of Regulation (CE) No. 2073/05, it is necessary for the official/legal samples, in which research for *Salmonella* spp. and *Listeria monocytogenes* are the subject, the application of the standardised testing method (ISO), as set forth in the above-cited Regulation. For the genus *Salmonella* we proceeded, in the case of positive results, to a successive identification of the species. For the samples not subject to this obligation, we resorted to equivalent accredited methods (Zavanella, 2000).

Results and discussions

The study has taken into consideration all the meat, poultry-based products, turkey and quail samples, arriving at the laboratory during the period from 01/19/05 to 10/30/08.

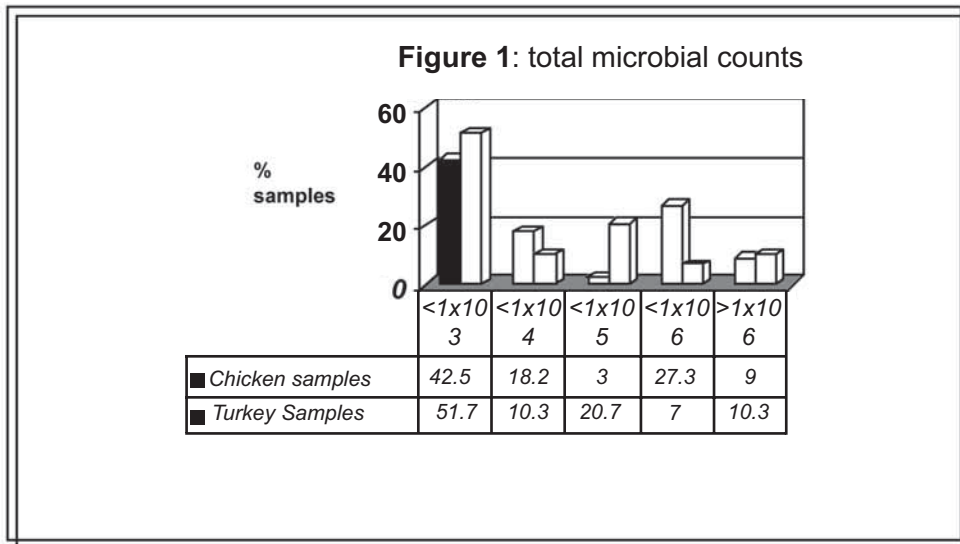
There were examined: 180 chicken samples (forequarters, leg, whole chicken, breast, filet, muscle, wings and roast), 66 turkey samples (muscle, thigh, breast, leg, wing, roast, cutlet and sausage), 5 quail samples (muscle).

In all, controls were conducted on 251 samples for a total of 550 analyses, inasmuch as not all the same number of analyses was conducted on all samples.

With regard to total microbial counts, almost half of the controlled samples of chicken and turkey show a low contamination (< 1000 UFC/g) and only a few samples had high microbe contamination (Figure 1); in particular, the maximum value found is of 6×10^8 UFC/g in a turkey cutlet sample. It is to be noted, from a legislative point of view, there have been no reference limits established specifically regarding poultry meats. The Regulation CE 2073/2005 refers solely the values of total bacterial contamination regarding minced meat and meat preparations that must be within a range of $5 \times 10^5 - 5 \times 10^6$ UFC/g. These data, however, coincide with that reported in the bibliography (Pasqual Anderson, 1992; Tompkin, 1983) whereas they are shown to be much higher with respect to that recently found by Teldeschi (2002) in samples of meat from chicken and products derived from chicken.

With reference to *Coliform* totals, 70% of the chicken samples show a load < 30 UFC/g, and only 13% have loads superior to 100 UFC, for a maximum of 3000 UFC in a chicken leg sample. These results are super-imposable with regard to turkey, apart from a sample of cutlet in which there was a load of 22×10^5 UFC/g.

For *E. coli* the analyses presented results lower than the threshold level of the analyses (<30UFC/g) in more than 90% of the samples. The few positive samples, however, remain within the limits set by Regulation CE 2073/2005 with regard to preparations



based on meat. Our results are shown to be lower than those recently reported by De Giusti *et al.* (2007).

95.3% of the analysed samples do not demonstrate contamination by *Staphylococcus aureus*, while the remaining 4.7% demonstrate low contamination equal to 30 UFC/g (chicken muscle and turkey leg). Vural *et al.* (2006) reported positive in 65% of the poultry samples while De Giusti *et al.*, (2007) did not find detectable loads. In the United States contamination by these bacteria involves only 6.4% of the samples (Jackson *et al.*, 2007). The analyses have not shown *Clostridium perfringens* and *B. cereus* (limits of the analyses <math><30</math> UFC/g). The Sulphate-reducing Clostrides anaerobes, in this case *C. perfringens*, are reported in moderate quantities by Lindblad *et al.* (2006) and agree with our results just as it also does with respect to *B. Cereus*.

With regard to *Salmonella* spp., only two samples (both chicken legs) in 180 (circa 1.1%) gave positive results: one to *S. typhimurium* and one to *S. enteritidis*; only one turkey sample resulted positive, however, to *S. blokley* and two out of five of the quail samples analysed resulted positive to *S. typhimurium*. Also Lindblad *et al.* (2006) reports a contamination in the carcasses of chicken slaughtered in Sweden inferior to 0.8%. This low prevalence was expected because the poultry industry is made up of groups typically integrated with a pyramidal structure at the top of which there are players that are kept *Salmonella free* (Ceruti *et al.*, 2003, 2004). Around 3% of the samples analysed resulted positive to *Listeria monocitogenes* but within the limits of law (Regulation CE 2073/2005) recently fixed at 100 UFC/g. The search for *Campylobacter* thermophiles involved only 50 samples and only 5 were positive. This data contrasts with the data of Ricci *et al.* (2006) which during a focused monitoring plan found very high prevalences both by cloacal swabs (83.33% of samples were positive) and directly from carcasses (77.9% prevalence); the isolated strains belonged prevalently to the species *C. jejuni*. The sampling, however, was executed on carcasses removed directly from slaughter without refrigeration or freezing. These latter two systems of conservation

appear to determine a notable reduction in the contamination of meats. Therefore, on the one hand the data probably obtained overestimated results with respect to actual contamination in poultry found in commerce, but on the other hand, however, it must not be forgotten that *Campylobacter* is a micro-organism characterised as infectious to man in low doses and, therefore, a few hundreds of UFC can be sufficient to cause alimentary toxic infection.

Conclusions

The results obtained in the present research are in line with or even inferior to those reported in the cited bibliography and fall within very high qualitative parameters, clearly within the limits set by national legislation. Such results should not be surprising considering the increased attention of the poultry industry toward the preventive and prophylactic systems, both during factory farming of the poultry species for meat, and during the slaughtering phase and preparation of their products, thus confirming the efforts made to pursue the objectives proposed by the HACCP system, by the strict bio-safety standards adopted and the principle of control of the supply chain "from farm to table". With regard to Salmonella, the prevention starts already at the breeding of the poultry which, besides being tested, are subjected to specific immunisation plans, overall for infections by *S. enteritidis* and *S. gallinarum*, in putting into action all that is planned also by the Regulation (CE) No. 2160/2003 on the control of salmonella and other zoonotic agents specifically present in food. In conclusion, we believe it is necessary that the hygienic-sanitary quality of poultry meats produced in our territory are to be considered optimum and in conformance with the provisions of legislation currently in force.

Bibliography

- Ceruti R., Gavazzi L., Manarolla G., Stonfer M., Gallazzi D., Grilli G. (2003) "Salmonella spp. in broiler flocks and hatcheries in northern Italy: 2 years of bacteriological monitoring". Proc. the Fifty-Second Western Poultry Disease Conference, Sacramento, California, 8-11 March, 2003
- Ceruti R., Gavazzi L., Ferrazzi V., Gallazzi D., Grilli G. (2004) "Presenza di *Salmonella* spp. nell'allevamento del pollo riproduttore pesante" ("Presence of *Salmonella* spp. in heavy chicken reproduction farming"). IV Workshop Nazionale Enter-net Italia, Sistema di Sorveglianza delle Infezioni Enteriche – Diagnostica ed Epidemiologia delle zoonosi trasmesse da alimenti (*Surveillance System for Enteric Infections - Diagnosis and Epidemiology of zoonosis transmitted by foods*), Rome, Istituto Superiore di Sanità, 25-26 November, 2004: 38
- De Giusti M., Tufi D., Marinelli L., Aurigemma C., Marzuillo C., Boccia A., (2007) "Qualità microbiologica di produzioni avicole." ("*Microbiological quality in poultry production*") Atti VI Workshop Nazionale Enter-net Italia, Sistema di sorveglianza delle infezioni enteriche, (*Surveillance systems for enteric infections*) 17-18 May, Rome
- Lindblad, M.; Lindmark, H.; Lambertz, S. T.; Lindqvist, R. (2006) "Microbiological baseline study of broiler chickens at Swedish slaughterhouses", Journal of Food Protection 69 (12) : 2875-2882.
- Pasqual Anderson M.R. (1992) "Metodologia analítica para alimentos y bebidas" Analytical methodology for foods and drinks), Microbiologia alimentaria (*Alimentary microbiology*) 163-170, Madrid.

Regulation (CE) of 15 November, 2005 No. 2073/2005 of the Commission “Sui criteri microbiologici applicabili ai prodotti alimentari”. (*On microbiological criteria applicable to alimentary products*).

Regulation (CE) of 17 November, 2003 No. 2160/2003 of the European Parliament and Council Parlamento Europeo e del Consiglio “sul controllo della salmonella e di altri agenti zoonotici specifici presenti negli alimenti (*on the control of salmonella and other zoonotic agents specifically present in foods*)

Ricci A., Amato S., Barco L. (2006) “Studio sulla prevalenza di *Campylobacter* spp. In allevamenti di polli da carne della regione Veneto” (*Study on the prevalence of *Campylobacter* spp. In farms of broiler chickens in the Veneto Region*) Centro Nazionale di Referenza per le Salmonellosi, Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro (PD), Atti XLIV Convegno Nazionale Associazione Scientifica di Avicoltura, 30 March, Forli,

Teldeschi E. (2002) “Valutazione di alcuni parametri qualitativi del pollo macellato” (*Evaluation of some qualitative parameters of chicken carcasses*) Università degli Studi di Milano, Facoltà di Medicina Veterinaria.

Tompkin R.B. (1983) “Indicator organisms in meat and poultry products”, *Food Technology* (June) : 107-110.

Vural, A.; Erkan, M. E.; Yesilmen, S. (2006) “Microbiological quality of retail chicken carcasses and their products in Turkey”, *Medycyna Weterynaryjna* 62 (12) : 1371-1374.

Zavanella M. (2000) “Metodi per l’analisi microbiologica degli alimenti”, (*Methods for the microbiological analysis of foods*) ed. Fondazione Iniziative Zooprofilattiche e Zootecniche – Brescia.