

Microbiological quality of mechanically recovered meat made from pork and poultry

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Background/ Objectives

The quality of mechanically recovered meat, its good technological characteristics and comparatively low cost make the product a profitable and useful raw material.

Meat removed from bones by machines is generally termed mechanically deboned meat (MDM), mechanically deboned tissue (MDT), mechanically separated meat/ tissue (MSM/ MST) or mechanically recovered meat (MRM).

Both red meat and poultry meat can be a source of pathogens such as *Salmonella* spp., *Campylobacter* spp., enterohaemorrhagic *E. coli* O157:H7, *Listeria monocytogenes*, *Yersinia enterocolitica*, *Staphylococcus aureus* etc., as well as spoilage bacteria, such as *Pseudomonas*, responsible for the development of rancidity. Therefore it is essential that all sanitary and hygienic measures concerning the raw material to be used for the production of MRM are absolutely restricted and controlled. Meat quality can be judged very well by the quality of microbes (NURMI, 1997). In the present investigation, the microbial quality of MRM was investigated.

Material and methods

MRM meat production

During the period February 1 to July 1, 1997, 36 samples of two types of MRM produced with the „Lima“ and „Protecon“ separator machines, respectively, were investigated for pathogenic bacteria.

For the detection of *Salmonella*, *Campylobacter*, *Yersinia*, enterobacteriaceae and total cell counts, methods were used as set down in paragraph 35 of the LMBG and in ISO 6579 : 1993 (E), ISO 10272 : 1995 and ISO 10273. *Listeria* were cultivated in a *Listeria* enrichment broth (Oxoid SR 149) at 30° C for 24 h. For the detection of *Listeria*, two selective agars (Palkam and Oxford agar [Oxoid]) were used, with cultivation for 24 h, 48 h, and 7 d, at 37° C. All detected bacteria were further differentiated serologically or biochemically.

Results

The results of bacteriological investigations of „Protecon“ type MRM are presented in Table 1.

Further differentiation of the salmonella provided confirmation of the presence of *S. typhimurium* and *S. dublin*, while the *Yersinia* were proved to be *Y. enterocolitica* Serovar 0:5, Biovar 1a (non-pathogenic microbe). Biochemical differentiation of *Listeria* demonstrated *L. grayi*, *L. welshimeri*, and *L. innocua*. When host animal species are compared, *C. coli* is found most frequently in pigs and pork. The following *Campylobacter* were detected: *C. coli*, *C. sputorum faecalis* and *C. jejuni* II.

Discussion

MRM - obtained from pork and in recent years also from poultry meat - is still used for the production of boiled sausages and meatballs. The hygienic quality of these products in our investigations, a large part of these products proved to be of poor hygienic quality.

MRM can show a bacterial content as high as 1.5×10^3 to 3.4×10^6 tvc/g for total plate count, and 1.8×10^4 to 6.5×10^6 tvc/g for enterobacteriaceae. The rates of detection of *Salmonella* (16.6%), *Campylobacter* (50.0%) and *Listeria* (22.2%) are also on an elevated level.

The results of investigation in other countries also show a high rate of contamination of MRM with salmonella and *Staphylococcus aureus*, as well as with other coliform bacteria (BANKS and BOARD, 1993; ADAMS and MEAD, 1983). The importance of the degree of freshness of the original material cannot be overestimated.

An expert group of the Scientific Veterinary Committee, which advises the EU Commission in matters concerning public health, has recommended the maximum bacterial contamination of separated meat shown in Table 2.

The samples we investigated were obtained immediately after production and transported chilled to the laboratory within three hours. If MRM is not cooled immediately, the total plate count can soon exceed the barrier to spoilage levels. When raw materials with high contamination levels - resulting in MRM with high contamination levels - are used, it is not possible to safely guarantee the criteria of quality products even in heated products such as boiled sausages, due e.g. to heatstable toxins of some bacteria.



References

- ADAMS, 8. W., G C. MEAD (1983):
Incidence and properties of *Staphylococcus aureus* associated with turkeys during processing and further-processing operations
J. Hyg. Lond. 91(3), 479490
- Conditions sanitaires de preparation, de commercialisation et d'utilisation des viandes separees mecaniquement.
Arrete du 23 avril 1996 modifiant l'arrete du 23 fevrier 1994
Journal Officiel de la Republique Francaise, 6348, 25.04,1996
- BANKS, J. G., R. O. BOARD (1983):
The incidence and level of contamination of British fresh sausages and ingredients with salmonellas.
J. Hyg. Lond. 90 (2>, 213-223
- CLITRAVI (Centre de Liaison des Industries Transformatrices de Viandes de L'U. E.) (1997):
European Standard for Mechanically Separated Meat.
OLITRAVI/AVEC/European Cornmission, Brussels
- Code of Practice for MRM and Poultry Meat (1994):
Recommended International Code of Practice for the Production, Storage and Composition of MRM... (CAC/RCP 32-1983)
Codex Alimentarius, Volume 10 - 1994
- Council Directive 6414331E~C, last amended and updated by Directive 95123 of June 1995
Article 2c
- NURMI, E (1997):
Draft report on mechanically recovered meat; health rules applicable to the production and use of mechanically recovered meat.
EU-Working Group; Cecilie LAHELLEC (F), E. NURMI (SF), CH. RING (D), N. SKOVGAARD (Dk)
Working group meetings July 1, 1996, January 7,1997, and May 16, 1997 in Brussels

Tables

Table 1: Presence of pathogenic bacteria in „Protecon“ type MRM

No. samples investigated	total plate count	Enterobacteriaceae	Salmonella (%)	Campylobacter (%)	Yersinia (%)	Listeria (%)
36 from pork	1.5 x 10 ³ to 3.4 x 10 ⁶	1.8 x 10 ⁴ to 6.5 x 10 ⁶	16.6	50.0	5.5	22.2
36 from poultry	4.2 x 10 ⁵	2.7 x 10 ⁷	32.3	38.5	-	11.6

Table 2: Recommended bacteriological guidelines for MRM (NURMI et al. 1997)

	total plate count 25° C/ 3 d (ISO)		Enterococci (Slanetz and Bartley Medium) 44° C/ 2 d		Enterobacteriaceae	
	m	M	m	M	m	M
MRM red meat	5 x 10 ⁵	5 x 10 ⁶	5 x 10 ³	5 x 10 ⁴	5 x 10 ³	5 x 10 ⁴
MRM poultry meat	5 x 10 ⁵	5 x 10 ⁶	5 x 10 ³	5 x 10 ⁴	5 x 10 ⁴	5 x 10 ⁵