MICROBIOLOGICAL REQUIREMENTS OF THE EU-COUNCIL DIRECTIVE FOR MINCED MEAT -ACTUAL RESULTS

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Background

Since the 1st of January 1996, the Council Directive 94/65 EC, "laying down the requirements for production of, and trade in, minced meat and meat preparations" is in force. Among other provisions, it requires regular microbiological monitoring in establishments that produce minced meat and meat preparations. Concerning minced meat, the **daily** examination of aerobic mesophilic bacteria, salmonella, *Escherichia coli* and *Staphylococcus aureus* is compulsory.
The previous Council Directive (88/657/EEC) which was put into force in 1992 "laying down the requirements for production of, and trade in, minced meat, meat in pieces of less than 100 grams and meat preparations ..." required the **daily** examination of aerobic mesophile bacteria, and salmonella. Samples only had to be examined for *Escherichia coli*, sulphite-reducing anaerobes and staphylococci **once a week**.
The objective of this examination is to investigate whether, and to what extent, these modifications influence the interpretation of minced meat samples.

Microbiological criteria of the EU-Directives concerning minced meat

Correspondences and differences of the microbiological standards in accordance with the current and the previous Directive are listed in **table 1**. The results of each minced meat unit have to be compared with the limit values given in this table. Five units form one consignment. The interpretation of each consignment is carried out as discribed in the table´s legend.

Methods

All investigated minced meat samples were derived from beef, and were supplied by one slaughtering and cutting plant in Southern Germany. Every consignment comprised five units, each weighing at least 100 grams. The microbiological examinations were carried out in accordance with the methods demonstrated in **table 2**.
The investigation consisted of two groups of minced meat samples. The first group of consignments monitored between July 1994 and July 1995 were interpreted according to the previous Directive. The second group consisted of samples monitored from August 1995 until March 1996. The latter were judged in accordance with the current Directive.

Results and discussion

Mean and standard deviation of both investigated groups of minced meat units are listed as lg cfu/g in **table 3**. Compared with the results of KLEIN and LOUWERS (1994), our findings in both groups indicated an approximated 1 lg cfu/g lower aerobic mesophile bacteria count, whereas the numbers of *E. coli* and *S. aureus* were approximatly 0.5 lg cfu/g higher than the results of KLEIN and LOUWERS.
The comparison of the two groups indicates that the second group which was monitored from August 1995 until March 1996 showed slightly higher counts of aerobic mesophile bacteria, *S. aureus* and *E. coli* than the first group. This small difference cannot be regarded as a sign of major decline in hygiene quality.
The interpretation of the samples is listed in **table 4**. When judged by the previous Directive, 75.8 % of the investigated minced meat consignments fulfilled the requirements. When using the standards of the current Directive, only 60 % of the samples could be interpreted as satisfactory or acceptable and 40 % had to be considered unsatisfactory.
The results of these two groups of minced meat units, without distinct change in microbial quality, clearly show that the examination according to Directive 94/65/EC leads to a 16 % increase in unsatisfactory minced meat consignments.
This situation is caused by the daily monitoring of not only aerobic mesophile bacteria and salmonella, as required in Directive 88/657/EEC, but the additional daily investigation of *E. coli*, and *S. aureus*. It is not clear why the microbiological standards of the previous Directive have been lowered, while at the same time the frequency of the individual examinations considerably increased.
An important issue regarding daily investigations is that "pooling" of units from one consignment, as it is sometimes carried out to reduce costs, is not advisible. The testing of five single units is decisive for the interpretation of the samples (see table 1, value c).

Conclusions

The examination of minced meat in accordance with Directive 94/65/EC leads to a considerably higher rate of unsatisfactory consignments than Directive 88/657/EEC did. It is questionable whether such a strict interpretation is feasible or justifiable.

Literature

Klein, G. und Louwers, J. (1994): Mikrobiologische Qualität von frischem und gelagertem Hackfleisch aus industrieller Herstellung. Berl. Münch. Tierärztl. Wschr. **107**, 361-367.

Table 1: Criteria of the current and previous EU-Directives (94/65/EC and 88/657/EEC) concerning minced meat for solid media

Bacteria groups	3m[a)]	M[b)]	c[c)]	S[d)]
Aerobic mesophile bacteria	$1.5 \cdot 10^6$	$5.0 \cdot 10^6$	2	$5.0 \cdot 10^8$
Escherichia coli	$1.5 \cdot 10^2$	$5.0 \cdot 10^2$	2	$5.0 \cdot 10^4$
Staphylococci*)	$1.5 \cdot 10^2$ *)	$5.0 \cdot 10^2$ *)	1*)	$5.0 \cdot 10^4$
Staphylococcus aureus	$3.0 \cdot 10^2$	$1.0 \cdot 10^3$	2	
Sulphite-reducing anaerobes*) cancelled in Directive 94/65/EG	$3.0 \cdot 10^1$	$1.0 \cdot 10^2$	1	$1.0 \cdot 10^4$
Salmonella	absence in 25 g*) / in 10 g, c=0			

*) Previous Directive (88/657/EEC) differing from criteria of the current Directive (94/65/EC)
a) 3m (cfu/g) indicates the threshold of each unit leading to the interpretation "**satisfactory**" for the consignement
b) Consignments with one unit lying above the threshold value M (cfu/g) are considered to be **unsatisfactory**
c) Consignments with units within 3m and M are judged "**acceptable**", assuming that value c (e.g. 2/5) is not exceeded
d) The microbic limit value S (cfu/g) indicates when the product must be considered toxic or tainted

Table 2: Methods of the Microbiological Examination

Bacteria groups	Official method	Medium	Incubation	Confirmation
Aerob. mesoph. bacteria	§ 35 LMBG[1)], L 06.00-19	Plate Count Agar	30 °C, 72 h	---
Escherichia coli	§ 35 LMBG, L 06.00-36	Escherichia Coli Direct Agar	44 °C, 18 h	Fluorescence, Indole Test
Staphylococci, *Staphylococcus aureus*	ISO/CD 6888-1	Baird-Parker Medium	37 °C, 48 h	Coagulase test
Sulphite-reducing anaerobes	§ 35 LMBG, L 06.00-39	Sulphite-cycloserine-azide-medium	37 °C, 48 h, anaerobic	Reverse-CAMP Test, Acid Phosphatase biochemical, serological
Salmonella	ISO 6579	Buffered Peptone Water, Selenite-cystine, Rapp.-Vassil., BPLS, XLD		

1) Official collection of examination methods according to § 35 LMBG (German Food Law)

Table 3: Mean and standard deviation of beef minced meat units according to literature and own results

Bacteria group	arithmetic mean in lg cfu/g - (standard deviation)		
	KLEIN and LOUWERS (1994) n=295	Group 1 July 1994 - July 1995 n=*	group 2 August 1995 - March 1996 n=175
Aerobic mesophile bacteria	5.80 (0.75)	4.73 (0.85)	4.85 (0.79)
Escherichia coli	0.82 (0.25)	1.24 (0.48)	1.33 (0.57)
Coagulase-positive Staphylococci	1.16 (0.59)	1.47 (0.66)	1.62 (0.72)
Sulphite-reducing anaerobes	#	1.00 (0.18)	#

* Aerobic mesophile bacteria: n=725, others: n=210
\# not examined

Table 4: Interpretation of the examined minced meat consignments

Interpretation	Directive 88/657/EEC Consignments of Group 1 (n=145)[1)]	Directive 94/65/EC Consignments of Group 2 (n= 35)[2)]
Satisfactory	63.4 %	34.3 %
Acceptable	12.4 %	25.7 %
∑ Consignments fulfilling the requirements	75.8 %	60.0 %
Unsatisfactory	24.2 %	40.0 %

1) 725 units form 145 consignments (July 1994 - July 1995)
2) 175 units form 35 consignments (August 1995 - March 1996)