Consequences EC 2073/2005 on sampling meat products

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Introduction

On January 2006, the Commission Regulation (EC 2073/2005) of 15 November 2005 on microbiological criteria for foodstuffs was implemented. This Regulation laid down the microbiological criteria for certain micro-organisms and the implementing rules to be complied with by food business operators when implementing the general and specific hygiene measures referred to in Article 4 of Regulation (EC) No 852/2004. The competent authority shall verify compliance with the rules and criteria laid down in this Regulation in accordance with Regulation (EC) No 882/2004, without prejudice to its right to undertake further sampling and analyses for the purpose of detecting and measuring other micro-organisms, their toxins or metabolites, either as a verification of processes, for food suspected. Besides the general criteria for some products limits are given to which certain micro organisms may be present. Those limits are divided into food safety criteria and process hygiene criteria.

There is an uncertainty about the implementation of the Regulation and the consequences for the industry when the results do not meet the criteria. A study has been carried out on data from literature and practice to diagnose the consequences of the proposed microbiological criteria for the meat sector. In this outline, the situation for *Salmonella* is described.

Materials and methods

Literature data of *Salmonella*, present in meat products, were collected for different animal species. Those data were compared with official data from Dutch Food Authorities (VWA).
An overview of the microbiological criteria, described in the Commission Regulation (EC 2073/2005) with respect to meat and meat products was made. The sets of data were statistically analyzed.

Results

By the Dutch Food Safety Authorities incidences of *Salmonella* in several product groups are monitored and given in Table 1. From this table it can be seen that the incidence of *Salmonella* has decreased since 2002. Little information is known about *Salmonella* incidences in fermented sausage.

Table 1. Incidence of *Salmonella* in meat and meat products from 2002 till 2005 (VWA)

Product group	2002		2003		2004		2005	
	n	% positive	n	% positive	n	% positive	n	% positive
Beef meat	nk	3	680	0,6	740	1,4	770	1,4
Veal meat	nk	nk	nk	nk	252	0	199	0
Pork meat	nk	10,5	227	4,9	333	1,5	403	2,0
Sheep meat	nk	nk	50	0	161	0	129	0
Poultry	1600	13,4	1510	11,2	1482	7,4	1474	9,4
Fermented sausage	nk	nk	nk	nk	749	1,0	nk	nk

n: number of samples,
nk: not known

In EC Regulation 2073 several criteria for *Salmonella* in meat are mentioned. The process hygienic criteria are given in table 2, the food safety criteria in Table 3.

Table 2. Process hygienic criteria of *Salmonella* on carcasses

Carcasses of	Micro organism	Sampling plan (100 cm^2)	
		n	c
Cattle, sheep, goats and horses	*Salmonella*	50	2
Pigs	*Salmonella*	50	5
Poultry of broilers and turkeys	*Salmonella*	50	7

n: The 50 samples are derived from 10 consecutive sampling sessions in accordance with the sampling rules and frequencies laid down in the Regulation.
c: The number of samples where the presence of salmonella is detected.

Table 3. Food safety criteria of *Salmonella* on several meat products

Food category	Sampling plan		limits
	n	c	
Minced meat and meat preparations intended to be eaten raw	5	0	Absence in 25 gram
Minced meat and meat preparations made from poultry meat intended to be eaten cooked	5	0	Absence in 10 gram (till 31-12-2009) Absence in 25 gram
Minced meat and meat preparations made from other species than poultry intended to be eaten cooked	5	0	Absence in 10 gram
Meat products intended to be eaten raw	5	0	Absence in 25 gram
Meat products made from poultry meat intended to be eaten cooked	5	0	Absence in 10 gram (till 31-12-2009) Absence in 25 gram

n = number of units comprising the sample;
c = number of sample units which may exceed the limit.

Discussion

For beef carcasses, *Salmonella* may be present till an average of 4% before the food business operator must take action. For pork this average is 10% and for poultry the average is 14%. When the sampling results of *Salmonella* on carcasses exceed these percentages, supplementary action on hygienic must be taken. For most of the products, *Salmonella* must be absent in 5 times 25 gram, which in fact means absence in 125 gram. As can be concluded from the data in Table 1, it will not be feasible to produce *Salmonella*-free meat. Implicitly the production of *Salmonella*-free meat products like minced meat and fermented sausage is not realistic.

The incidence of *Salmonella* on fresh meat and meat products depends on the incidence of *Salmonella* on the raw material and the reduction which take place during the process. Given a certain occurrence of *Salmonella* on meat (e.g. 2%) it can be expected that 1 in 50 samples on average will be positive. This means that on sampling meat product batches the criteria of *Salmonella* will be exceeded from time to time. The question rises if such a batch in fact contains a higher risk than other batches or if the exceeding is due to the scattering of the data? Statistics can give some insight in acceptance or rejection of batches which are, regarded to *Salmonella* occurrence, equal. Above is worked out in table 4.

When a food business produces approximately 300 batches a year with an average batch contamination between the 1 and 3 %, each year an amount between 15 and 42 batches will have to be rejected (based on n=5, c=0) while the contamination is still on the average level.

When for instance 9 batches are highly contaminated at a higher level (e.g. 20%), 3 batches will still be accepted and only 6 batches will be rejected.

Table 4. Chance of acceptance and reject of batches meat product at different average batch contamination evaluated conform EC regulation sampling plan

Sampling plan	Average batch contamination	Chance [%]	
		Acceptance	Reject
n = 5 c = 0	1%	95.1	4.9
	3%	85.9	14.1
	10 %	59.1	40.9
	20 %	32.8	67.2

Conclusions

In the EC Regulation 2073/2005 microbiological criteria on *Salmonella* for meat and meat products are not based on risk assessment. It looks like the criteria are based on the one hand on desirability and on the other hand on alleged feasibility. A certain incidence of *Salmonella* is allowed on carcasses (4% or higher) but products thereof like minced meat or fermented sausages may not contain any *Salmonella* in 50 gram of even 125 gram. This means the sampling plan, set up by the EC Regulation is unsatisfactory to judge batches of meat products concerning contamination with *Salmonella*.

Suggestion to an alternative sampling plan

In order to prevent products, which are brought onto the market with a more than normal risk of contamination with Salmonella, a few possibilities are mentioned.

Extend the amount of samples from 5 to 10. Table 5 will give the change of acceptance or rejection of a general contaminated batch. The judgment of a 3% contaminated batch in the market to be unsatisfactory will decrease towards 3.4 %.

Table 5. Chance of acceptance and reject of batches meat product at different average batch contamination evaluated conform alternative sampling plans

Sampling plan	Average batch contamination	Chance [%]	
		Acceptance	Rejection
n = 10 c = 1	1%	99.6	0.4
	3%	96.6	3.4
	10 %	73.6	26.4
	20 %	37.6	62.4

The costs, necessary to pay the extra microbiological examination will be less than the costs of the batches which are rejected in the market.

Another possibility is to create a two step sampling plan, in the first step n=5, c=1 and second step n=5, c=0. When the first c is 2 or more the batch will be rejected. In case c=1, a second sampling will be carried out for 5 samples. In non of the samples Salmonella may be found to accept the batch. With this sampling plan, costs are minimized and false rejection for a batch with 3% or lower contamination with *Salmonella* is 2,7%.

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