Effect of sulphamethazine on the ripening of Italian "salame casareccio"

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SUMMARY: Few differences in the chemical composition and in the sensorial evaluation have been detected among five groups of country-style salamis (salame casareccio) whether without or with sulphamethazine added at different concentrations. These might be due to different diameters of the casings and consequently to the slightly different rate of dehydration among and within the groups.

Only slight differences have been recorded in the total aerobic microbial count, Enterobacteriaceae and Lactobacillaceae among the groups during the ripening period. On the other hand a significative difference in the growth of Micrococcaceae has been detected between the group of salamis with the higher concentration of sulphamethazine and the other groups. This difference was even more evident in the Micrococcaceae/TMC ratio which was less than 1°/.. until the end of the 8-week ripening period in the group with the higher sulphamethazine concentration (0.5 ppm). The two controls without sulphamethazine and the group with 0.05 of this compound added showed a maximum Micrococcaceae/TMC ratio at the fourth week. Although Micrococcaceae is regarded an important family of bacteria in ripened meat products, no marked differences were found in these country-style salamis, probably because the short ripening period required made the metabolic activities of Micrococcaceae less relevant.

INTRODUCTION: Meat inspection surveys frequently detect sulphonamide residues in swine tissue due to their wide use in pig husbandry, both for therapeutic purposes and for prevention of common diseases. Sulphonamides must be withdrawn 21 days before slaughtering when administered at 3750-5000 mg/Kg in feed for 3-5 days because they are slowly metabolized. Contamination of non medicated feed occurs when medicated feed is prepared at the mill, and recycling of sulphonamides may occur through residues in faeces and urine (Epstein et al., 1988).

Italian researchers have recently reported that 10.5% of 123 aged cured Italian hams, bought in retail stores in several regions of our country, contained over 0.1 ppm sulphamethazine residue (Cortesi et al.,1990). Moreover, 14.6% of 48 aged cured hams processed abroad were positive for sulphamethazine residue at 0.1 ppm (Cattaneo et al.,1990). A monitoring programme set up in central Italy (Umbria region) led to the conclusion that 0,88-4.11% of regularly slaughtered pigs in 1989 had residues of antimicrobial compounds. The inhibition effect in the microbial test used to detect residues was positive in 30% of cases only when trimethoprim was added, suggesting the presence of sulphonamide residues (Severini et al.,1990). Since the sensitivity of the test used to sulphonamides is about 0.5 ppm, the percentage of pigs with a lower amount of these residues might even be higher.

This experiment was designed to evaluate whether and how sulphamethazine (SMT), which is one of the most widely used sulphonamides in pig husbandry, affects the quality of Italian ripened salami. In the microbiological evaluation particular emphasis was given to Lactobacillaceae, Micrococcaceae and Enterobacteriaceae since their growth is of utmost importance to the ripening of Italian salami (Cantoni et al.,1989; Censi et al.,1989).

MATERIALS and METHODS: Five groups of Italian "salame casareccio" were prepared by mixing ground pig meat, fat and a standard curing mixture and the following solutions:
- the first group was added with 100 ml of sterile distilled water and was used as a control;

in diameter. All salamis at the end of the ripening were classified as good quality products by means of a sensorial evaluation. Colour, smell and flavour were typical of this kind of product, likewise its aspect and consistency.

Data on the total mesophylic aerobic count (TMC) are reported in Figure 1. The values ranged from $695*10^3$ to $3.5*10^9$ ufc/g and the maximum values were reached during the last two weeks of ripening. The growth of mesophylic aerobic bacteria was similar for all groups, except for the first which had three times the amount of the other groups during the first week.

Data on Lactobacillaceae count are given in Figure 2. The proliferation of this bacteria was so fast that near maximum values were reached in all groups in the first week of ripening.

Values of Micrococcaceae at given times are reported in Figure 3. Until the fifth week the amount of this bacteria in the group with the highest concentration of sulphamethazine (0.5 ppm) was less than $4*10^4$ ufc/g, reaching a value of half a million ufc/g only at the eighth week. The two controls had a different increase in the number of Micrococcaceae, with maximum values ($4.75*10^5$; $4.3*10^5$) at the fourth week. The proliferation in the groups with 0.05 and 0.1 ppm sulphamethazine was higher than in the group with 0.5 ppm and lower than the control groups. The difference in ratio between Micrococcaceae and total mesophylic aerobic bacteria is even more explicative (Fig. 4). In the group with the higher SMT concentration (0.5 ppm) the ratio was less than 1°/.. until the end of the 8-week ripening period, where in the two controls without SMT and the group with 0.05 ppm SMT the maximum ratio (>2°/..)was observed as early as the fourth week. The group with 0.1 ppm SMT had a lower proliferation than the controls and the group with 0.05 ppm during the first five weeks, reaching a maximum ratio at the sixth week.

- the second group was added with 100ml of sterile NaOH 0.001N and was used as a control for the SMT solvent;
- the third group was added with 100ml of sterile sulphamethazine/NaOH solution (0.5%p/v);
- the fourth group was added with 100ml of sterile sulphamethazine/NaOH solution (1%p/v);
- the fifth group was added with 100ml of sterile sulphamethazine/NaOH solution (5%p/v).

The final concentrations of sulphamethazine in the products were therefore 0.05 ppm, 0.1 ppm and 0.5 ppm, respectively. An even spread of cure ingredients and sulphamethazine was achieved by mixing accurately. Then the five types of mixture were put into natural casings and ripened according to commercial methods.

Protein content, moisture, pH and Aw were evaluated in cured ground meat before processing and in salamis taken from each group. The sensorial quality of the salamis was evaluated by a panel test. The following microbiological evaluations were performed according to current methods: total aerobic microbial count (Tryptone agar media-BBL); Lactobacillaceae (LBS agar-BBL); Micrococcaceae (MSA agar-BBL); Enterobacteriaceae (Violet Red Bile Dextrose agar-Oxoid); Staphylococcus aureus (Baird-Parker medium-Oxoid); Enterococci (Barnes medium); Coliformis bacteria (Brilliant green bile broth 2%-BBL); sulphite-reducer Clostridia (Brain heart infusion agar-BBL).

RESULTS and DISCUSSION: Results of the chemical analysis are reported in Table 1. The pH values dropped sharply from 5.91 to below 5.50 during the first two weeks of ripening, then rose to slightly higher final values ranging from 5.43 to 5.72. No relevant differences among the groups were observed. Moisture and protein content varied, as is usual in this kind of country-style product, according to the dehydration rate and thus the differences

Enterobacteriaceae showed very little proliferation in all the groups except the first one which reached a value of 3200 ufc/g in the third week. Any effect on the growth of Enterobacteriaceae could be attributed to the addition of sulphamethazine.

The hygienic quality of the products was good: coagulase-positive Staphylococcus aureus was never detected; Enterococci were constantly at low levels (500-260000 ufc/g); Coliformis bacteria were less than 0.3 ufc/g; sulphite-reducing Clostridia were absent.

CONCLUSIONS: The addition of 0.5 ppm SMT to pigmeat used in manufacturing "salame casareccio" caused a significant difference only in the growth of Micrococcaceae and when the concentration of SMT was 0.5 ppm. The quality of the ripened salamis was not affected, perhaps because the metabolic activities of this group of bacteria are not of such importance in these salamis with a short ripening period.

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TABLE 1

PHYSIO-CHEMICAL EVALUATION OF FIVE GROUPS OF "SALAME CASARECCIO" ADDED OR NOT WITH SULPHAMETHAZINE (SMT).

		time (weeks)							
	groups*	0	1	2	3	4	5	6	8
pH	1	5,91	5,39	4,97	5,25	5,23	5,38	5,32	5,50
	2	5,91	5,40	5,48	5,63	5,34	5,54	5,56	5,48
	3	5,91	5,33	5,22	5,58	5,48	5,62	5,54	5,50
	4	5,91	5,36	5,22	5,48	5,34	5,36	5,56	5,72
	5	5,91	5,32	5,29	5,50	5,47	5,38	5,54	5,43
MOISTURE%	1	61,90	49,49	47,55	42,60	40,10	36,56	38,68	33,83
	2	61,90	48,10	47,37	40,51	40,04	39,40	34,67	39,73
	3	61,90	49,39	45,64	44,97	39,02	40,30	37,23	37,18
	4	61,90	49,10	46,36	41,37	37,84	41,70	33,41	33,83
	5	61,90	48,52	48,18	40,21	37,84	41,26	32,10	36,99
Aw	1	n.d.	n.d.	0,94	0,93	0,91	0,89	0,87	0,87
	2	n.d.	n.d.	0,93	0,91	0,90	0,88	0,87	0,88
	3	n.d.	n.d.	0,93	0,92	0,91	0,89	0,88	0,86
	4	n.d.	n.d.	0,93	0,92	0,90	0,87	0,86	0,86
	5	n.d.	n.d.	0,93	0,92	0,90	0,88	0,89	0,86
PROTEIN%	1	n.d.	19,30	17,79	19,27	n.d.	n.d.	19,51	21,15
	2	n.d.	18,45	18,87	22,44	n.d.	n.d.	22,16	24,17
	3	n.d.	19,65	18,39	20,23	n.d.	n.d.	22,90	23,08
	4	n.d.	17,85	18,46	20,11	n.d.	n.d.	22,31	21,23
	5	n.d.	17,94	17,96	19,85	n.d.	n.d.	19,97	19,17

*1=control; 2=NaOH control; 3=SMT 0.05ppm; 4=SMT 0.1ppm; 5=SMT 0.5pp

FIGURE 1

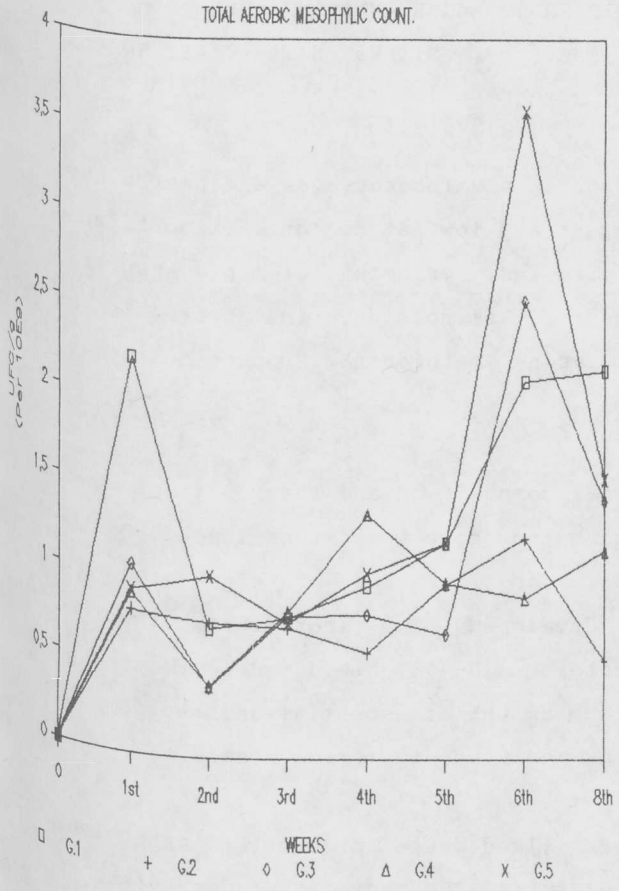

FIGURE 2

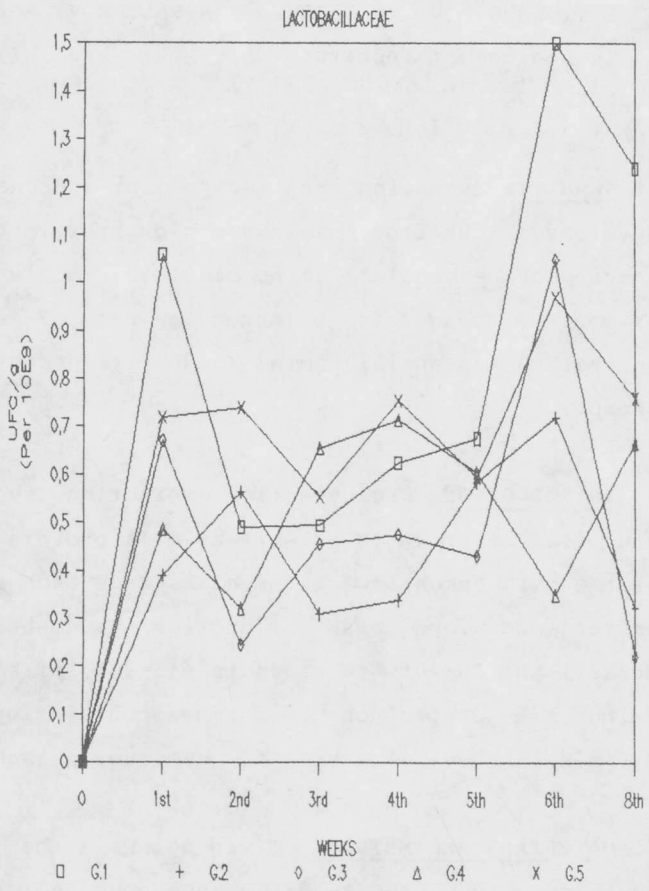

FIGURE 3

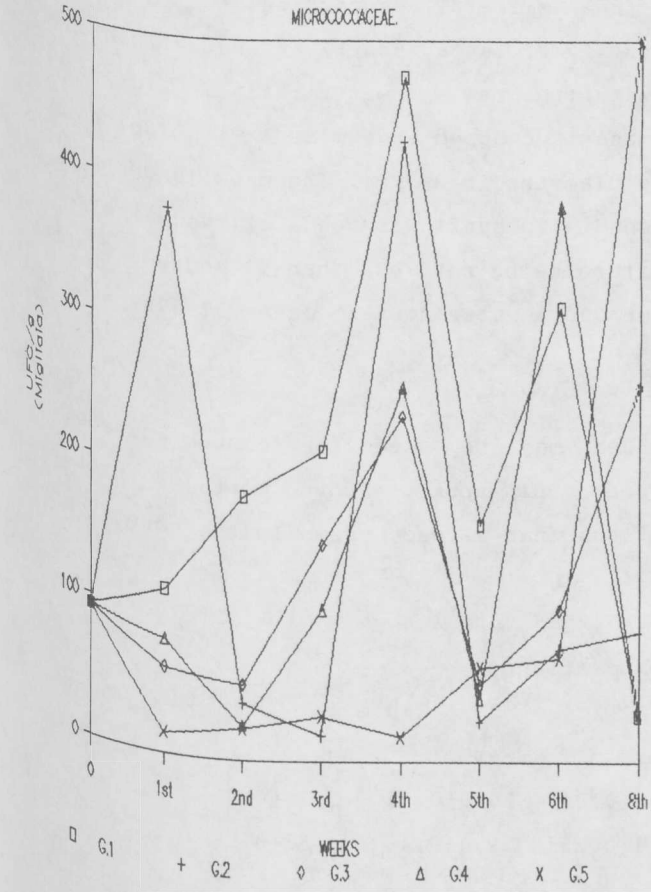

FIGURE 4