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EFFECT OF LACTIC ACID TREATMENT ON SURVIVING LISTERIA MONOCYTOGENES ON MEAT PACKAGED IN MODIFIED ATMOSPHERE

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Background:

It is now recognized that the human pathogen Listeria monocytogenes is widely distributed in the nature and can be isolated from a variety foods. Foods such as meat and meat products, milk and dairy products and vegetables contaminated with Listeria monocytogenes have been often linked with human listeriosis (Conner, 1990).

Reducing microbial contamination during processing to increase product safety and shelf live is important effort. One of many methods is application some organic acids on foods. Organic acids can be effective antimicrobial agents therefore lactic acid and acetic acid are approved for use as meat treatments (Pelroy, 1994).

Objectives:

The goal of this research was evaluete the efficiency of lactic acid for eliminating Listeria monocytogenes on pork meat packaged in modified atmosphere.

Methods:

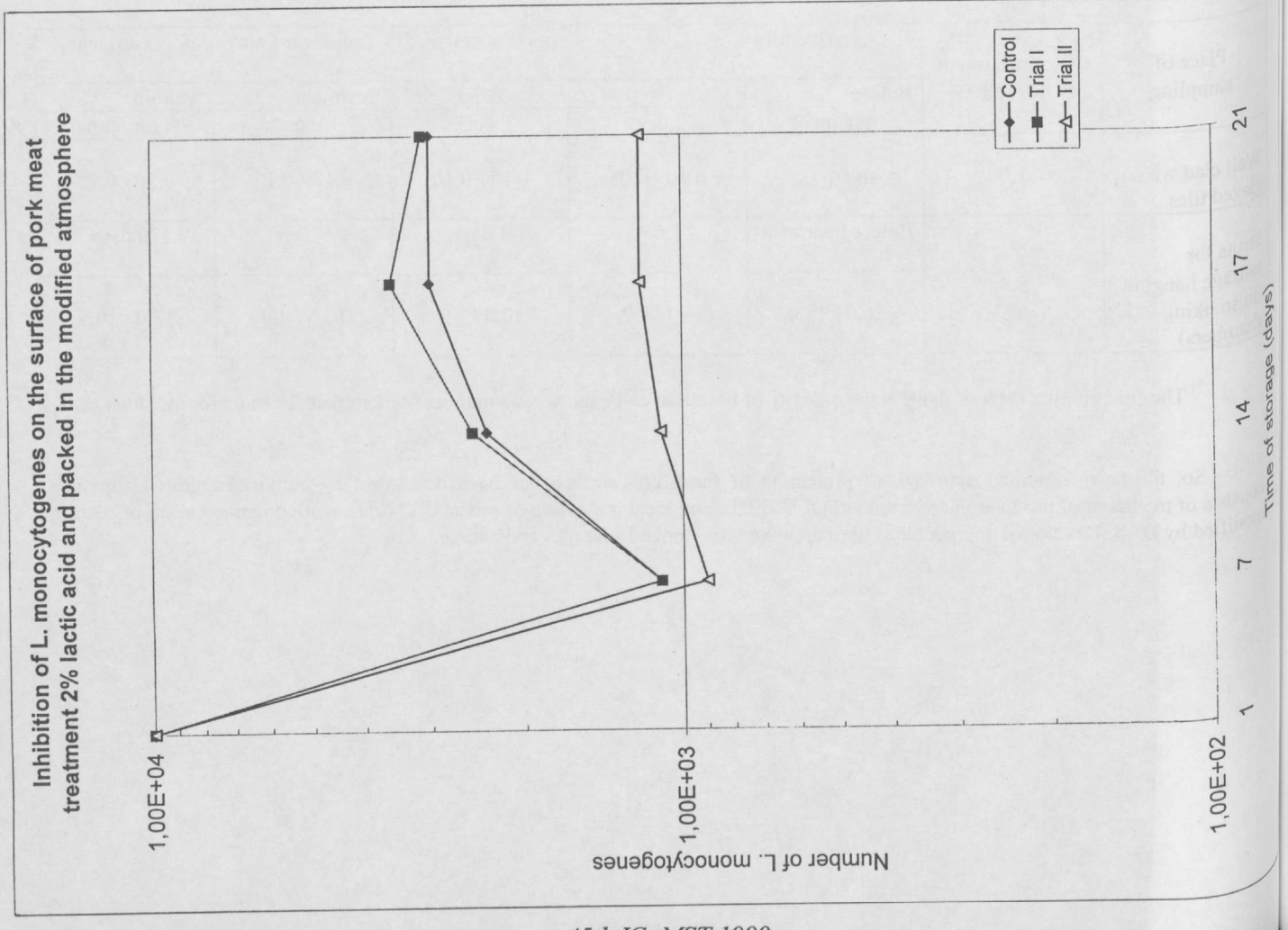
The surface of some pork carcasses were spayed with 2 % lactic acid (LACTIL) immediately after slaughtering. The carcasses were chilled to reach the internal temperature 4 °C.

Pork trims from m. longissimus dorsi were obtained the second day during deboning of carcasses.

Cultures Listeria monocytogenes CCM 5576 was used; culture was grown at 30 °C in TSBYE (Difco).

The experiment was divide into the following groups:

1. Meat samples (m. longissimus dorsi) treatment lactic acid on the carccas surface immediately after slaughtering



2. Meat samples (m. longissimus dorsi) treatment lactic acid on the carccas surface after slaughtering and sprayed with lactic acid and inoculated Listeria monocytogenes before packaging in modified atmosphere. We used two concentrations of suspension L. monocytogenes. The surface of some samles was inoculated 1 ml suspension 10^3 CFU/ml and some samples were inoculated the same way with 10^5 CFU/ml L. monocytogenes.
3. Control samples without any lactic acid treatment

All samples were packaged in modified atmosphere (composition of atmosphere 80 % oxygen, 20 % carbon dioxide - fa LINDE). Packaged samles from each group were hold at 4 °C and investigated after 5, 7, 14 and 21 days.

Microbiological investigation:

Samples were obtained to determine population of: L. monocytogenes, lactic acid bacteria, and aerobic and facultative anaerobic population

Listeria monocytogenes: Enrichment and cultural procedures for detection and isolation of L. monocytogenes were done according to the CSN-ISO 10560 regulations with slight modification (two enrichment steps UVM I, Fraser broth, inoculation on select medium Palcam and Oxford agar (Oxoid). Confirmation test were made by using API test (BioMerieux). Each sample was investigated for quantitative and qualitative determination of L. monocytogenes.

Lactic acid bacteria: MRS agar (Oxoid) 30 °C / 3 days

Aerobic and facultative anaerobic population: Tryptone Glukose Extract Agar (Oxoid) 30 °C / 3 days

Results and discussions:

The main task of our experiment was evaluation the possibility of reducing number of Listeria monocytogenes on the surface of pork meat packaged in modified atmosphere. The original number of L. monocytogenes were approximately 10^3 and 10^5 CFU/ml. Direct cultivation (without enrichment) samples with lower number L. monocytogenes (10^3/ml) was negative for all samples in the 14 days. After this time we found out positive results (10^1 - 10^2 per gram) only in control samples (without lactic acid treatment). After the enrichment procedure we harboured positive results both control and samples treatment lactic acid.

All samples with higher number L. monocytogens (10^5/ml) were positive by direct cultivation (Fig. 1). We have found out on samples treatment lactic acid before packaging some decreasing number of L. monocytogenes. The number of L. monocytogenes droped from 10^3 (1 week) to 10^2 per gram (3 week). The numbers of L. monocytogenes in control samples and samples lactic acid treatment only after slaughtering were approximately similar.

This experiment results provided some useful information concerning the antilisterial activity of lactic acid. There is evidence that lactic acid can reduce number of L. monocytogenes from food but this antilisterial effect is not sufficient for total elimination of L. monocytogenes.

Organic acids can be effective antimicrobial agents. Therefore acetic and lactic acids are approved for use as carcass treatment. In carcass reductions ranging from 1-4 $\log_{10}$ CFU/cm^2 in surface bacterial populations have been reported (Conner,1997). Contemporarely it has been indicated that the antimicrobial activity of many organic acids depends on many factors - pH, undissociated from of the acid molecule, temperature etc. which can influence the effect of organic acid (Shelef, 1994).

Conclusions:

Although L. monocytogenes is able to survive under acidic conditions results of survival studies indicate that lactic acid at 2 % concentrations can be only slightly effective for inactivation of L. monocytogenes on fresh meat packaged in modified atmosphere (20% CO_2 and 80 %O_2).

Pertinent literature:

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