Prevalence of L. monocytogenes and Listeria spp., in the environment and raw meat products during pig slaughtering, deboning and meat cutting operations.

Panoulis C., Genigeorgis C., Kokkinakis M., Tselentis, I.

Laboratory of Clinical Bacteriology Parasitology and Zoonoses, Medical School, University of Crete, Heraklion. Phone: +30-2810-394739, Fax: +30-2810-394740, E-mail: microlab@med.uch.gr

Summary: From 9/2001 – 6/2002 we estimated the prevalence of Listeria monocytogenes and Listeria spp., in the environment, and raw pork products of a meat plant. Of 41 environmental samples taken before and after initiation of slaughtering, in 2 visits, 10.7% and 7.7% of the samples respectively harbored L. monocytogenes. In each of 2 additional visits we collected 45 samples each time from carcass surfaces. L. monocytogenes was present 2.2% and 2.2% of the samples respectively. Of 109 environmental surface samples from the deboning room before and 104 taken 2-3 h after the beginning of the operation 3.7% and 5.8% harbored L. monocytogenes. Of 132 environmental surfaces samples taken before and 125 after the initiation of work in a special working area handling the cutting and packaging of modified atmosphere (MAP) consumer size meat cuts 3% and 5.6% harbored L. monocytogenes. Of 35 wholesale meat cuts from imported meat collected in the central deboning and cutting room 34.3% harbored L. monocytogenes. Finally of 201 consumer size MAP products prepared from the company's own pig carcasses, 6% harbored L monocytogenes. The results indicated the low prevalence of L monocytogenes on local origin carcasses and MAP cuts prepared from such carcasses under strict sanitary conditions. Cross contaminations of equipment and worker's hands from imported meats may result in excessive contamination of meat cuts whether the meat is imported or local.

Keywords: Listeria monocytogenes, prevalence, pork, sanitation, Listeria spp.

Introduction: Listeriosis mostly of sporadic nature remains a rare but serious human health problem. Meatborne outbreaks, some due to pork and processed pork products have been reported recently. Due to the psychotropic nature of the L. monocytogenes and its generally greater resistance to environmental and processing parameters, as compared to other foodborne non-sporoforming pathogens, this microorganism has created serious concerns for the food industry and regulatory agencies. Once processing plants are contaminated certain strains become established and their elimination is difficult (Tompkin, 2002). The prevalence of L monocytogenes in raw meats including pork can be as high as 50-100%. It is frequently isolated also from minimally processed refrigerated foods (Ryser and Marth, 1999). In this study we estimated the prevalence of L monocytogenes in a plant of a vertically integrated company supplying the pigs as well as importing fresh pork for further processing. The study became a necessity because the company introduced MAP to extend the shelf-life of special pork cuts and other raw products originated only from the company's pigs.

Materials and Methods: ISO 11290:98:1 methodology for recovery of L. monocytogenes and Listeria spp for meat products was used. For environmental testing sponges (TECRA environmental swabs) were used to swab 20X20 cm² areas. The sponges in their original container were transported for incubation in the laboratory where 20 ml of 1/2 Fraser Broth were added to each and incubated for 24 h at 30°C. The following steps were similar to meat handling. Carcass surfaces were sampled using a sterile 20X20 cm individually wrapped cotton pad to swab the neck, the back and the thigh area of each carcass. The swabs were placed in a plastic Stomacher bag containing 200 ml Buffered Listeria Enrichment broth with 0.1% Tween 80. In the laboratory they were handled as the other samples.
**Results and Discussion:** From 9/2001 – 6/2002 we visited the plant 7 times. Of 28 environmental samples taken before and 13 after initiation of slaughtering in 2 visits *L. monocytogenes* was present in 10.7% and 7.7% of the samples respectively. Overall *L. monocytogenes* prevalence was 15.8% and 4.5% during the 1st and 2nd visits respectively. In each of two other visits we collected 45 carcass surface samples after the processing of 75-100 pigs originating from the company’s nearby farm. The carcasses were sampled before and after the scalding tank, after dehairing and before and after final wash. The overall prevalence during the 1st visit for *L. monocytogenes* and *Listeria* spp was 2.2 and 4.4% respectively. The corresponding prevalence during the 2nd visit that followed extensive improvements in sanitation was 2.2 and 0%. No *L. monocytogenes* was found on carcasses after the final wash. In 6 additional visits to the deboning room we collected 109 environmental samples before and 104 samples 2-3 h after initiation of operations. In this room carcasses of the company’s own production and imported meats were handled at the beginning of the study. The prevalence of *L. monocytogenes* on the surfaces of saws, teflon, cutting boards, floors, plastic crates, knife sharpeners, knives and worker’s hands before the initiation of the operation was 9.1%, 0%, 16.7%, 12.5%, 0%, 0% and 0% respectively. The corresponding prevalence during operation was 0%, 0%, 12.5%, 0%, 14.3%, 0%, and 14.8%. The overall *L. monocytogenes* and *Listeria* spp prevalence was 4.7% and 33.3% respectively. The prevalence of *L. monocytogenes* for the 1st to the 6th visit before initiation of operations was 42.9, 8.3, 0, 0, 0 and 0 % respectively. The corresponding figures for samples taken during operations were 33.3, 7.7, 0, 0, 4.4 and 0%. Extensive improvements in sanitation were initiated after the 2nd visit. The room handling the consumer size MAP meat, a major raw meat product of the company was sampled 7 times. We collected 132 and 125 environmental samples before and after initiation of operations respectively. The prevalence of *L. monocytogenes* on the surfaces of teflon cutting boards, floors, meat cutting machine knives, worker’s knives and worker’s hands before and after the beginning of processing was 2.6%, 9.1%, 4.3%, 0%, 0%, and 0%, 12.0%, 16.7%, 0% and 3.6% respectively. The overall *L. monocytogenes* and *Listeria* spp prevalence before and after the operations started was 3, 4.3% and 5 and 16.9% respectively. The prevalence of *L. monocytogenes* in 35 wholesale meat cuts from imported meat, deboned in the central cutting room was 34.3% and 40% respectively. The corresponding prevalence of 201 consumer size MAP products originating from the company’s carcasses handle in MAP room was 6% and 22%. Identified factors contributing to environmental and product contamination included: 1) New employees, unfamiliar with the operation and *L. monocytogenes* controls, moving from other departments to the deboning and processing locations or to cleaning and sanitizing equipment; 2) Personnel handling processed products after working in contaminated areas without following instructions for sanitary handling of products; 3) Periods of heavy production making sanitation practices difficult; 4) Meat products delayed in processing lines thus supporting microbial growth; 5) Imported meats with high *L. monocytogenes* prevalence processed at the beginning of a working day thus cross contaminating equipment and eventually low *L. monocytogenes* prevalence local meats; 6) Personnel traffic patterns not following a defined schedule resulting in cross contaminations from dirty to clean areas and products; 7) Cleaning equipment parts on the floor; 8) Starting processing operations before the working environment was fully dry after the cleaning and sanitizing operations; 9) Waste bins, in the cutting and packaging area not maintained cleaned. Overall the study demonstrated the low prevalence of *L. monocytogenes* on the carcasses and MAP meats originating from local animals and processed under strict sanitary conditions. Improvements in sanitation and initiation of strict preventing measures decreased significantly the prevalence of *L. monocytogenes* as indicated by the results of the later visits as compared to the early visits.

**References:**