SUMMARY

The aim of this thesis was to study the technological possibilities of producing biopreservatives for meat products using the by-products obtained from the fermentation process of two strains of lactic acid bacteria, *Lactobacillus plantarum* and *Pediococcus pentosaceus*. Both are part of the collection of starter cultures of the collaborating company of this project, and are marketed for this purpose.

In the first part of this project, the conditions of industrial production of starter cultures were studied to determine the growth curves in a reference culture medium (MRS) and in experimental media. Whereas the highest counts and increased production of acids (greater decrease in pH) were obtained in MRS, this medium was selected to be used in the next phases of the project.

Next, different techniques for microbiological stabilization of the exhausted culture broths were tested, so that the antimicrobial effect would depended only on the metabolites produced by the microorganisms studied. Such techniques were pasteurization, partial purification and filtration. To determine the effect of the stabilization process on the antimicrobial properties of the stabilized broths, *in vitro* tests were performed against *Listeria innocua* as target microorganism. Thus, it was observed that pasteurization (P) and filtration (F) kept the antimicrobial properties of broths, unlike partial purification (PP), through which the antimicrobial activity was completely lost. Finally the filtration technique (F) was selected since this procedure would recover viable microorganisms (for producing starter cultures) while it is obtained an stabilized broth with its antimicrobial metabolites, unlike pasteurization because in this case the heat treatment kills the living microorganisms.

Considering the antimicrobial effect observed, it was studied the production of organic acids and the presence of other antimicrobial substances, such as hydrogen peroxide or bacteriocins. Both could not be detected in the fermentation broths, so that in the
conditions studied, the antimicrobial effect is attributed only to the presence of organic acids. To characterize the antimicrobial capacity it was determined the minimum inhibitory concentration (MIC) and minimum lethal concentration (CML). Comparing the antimicrobial effect of fermentation broths of 24 hours of both microorganisms on *L. innocua*, it was observed that the MIC and CML were lower for *L. plantarum* broth (L-24F) compared with *P. pentosaceus* broth (P-24F), which is related to the yield of acid.

As stated above, this project aims to develop a biopreservative that could be conveniently incorporated in a meat product. For this purpose, two drying techniques of the cell-free broths were compared: spray drying and lyophilization. Both allow obtaining a powdered product. Two support substances were tested, dextrin or maltodextrin. The powdered biopreservatives showed lower antimicrobial effect in *vitr*o (on *L. innocua*) than broths, which was attributed to the presence of the support. Moreover, it was tested the antimicrobial effect on *L. monocytogenes* and *E. coli O157: H7*, two pathogens of interest in the meat sector. In both cases, it was observed an antimicrobial effect similar to that obtained over *L. innocua*. The product obtained from *L. plantarum* showed the greatest antimicrobial capacity based on MIC and CML, in accordance to the increased acid production observed in fermentation broths before the drying process.

Finally, after characterizing the antimicrobial activity of powdered products, the antimicrobial effect on the native flora of meat products was studied. In the case of the powdered product obtained for *L. plantarum* (L-24FR) this study was performed in raw minced pork, showing a significant inhibitory effect especially over enterobacteria. In the case of the product obtained from *P. pentosaceus* (P-24FR,) a similar study was conducted but utilizing raw minced chicken. In this case it was also analyzed the use of the biopreservative along with modified atmosphere packaging (MAP) (22% O₂, 30% CO₂ and 48% N₂). It was observed a synergistic effect of the biopreservative and MAP, with a significant reduction of *Brochothrix thermosphacta* and pseudomonas counts. Both L-24FR and P-24FR exerted a negative effect on the meat product as their concentration augmented, due to a decrease in water holding capacity and changes in color.
The results of this thesis show the possibility of producing biopreservatives from *L. plantarum* and *P. pentosaceus* starter cultures from the collaborating company, although it should be considered the specific characteristics of the meat product and the doses required to achieve the desired extension of shelf life without altering its physicochemical and sensory properties.