CHAPTER 9
CONCLUSIONS AND RECOMMENDATONS

9.1 Conclusions

From the results of this study, it could be concluded that;

9.1.1 An optimum level of 100 IU/ml nisin in pasteurized milk could effectively control the microbial growth in the milk during 21 days of storage at 4 and 10ºC.

9.1.2 The presence of milk fat affected the effectiveness of nisin to inhibit *B. licheniformis* in the IMS solution. Fat levels of more than 2% (w/v) could reduce the activity of nisin against the target microorganism.

9.1.3 Supplementation of lactose, sucrose and casein did not enhance the effectiveness of 100 IU/ml nisin to inhibit *B. licheniformis* in the IMS solution during 21 days of storage at 4 and 10ºC.

9.1.4 The effectiveness of 100 IU/ml nisin to control the growth of *B. licheniformis* was supported in the presence of whey protein isolate.

9.1.5 A lag phase for at least 30 min before or after pasteurization at 72ºC for 15 s should be given to nisin in order to support the activity of the antimicrobial compound against *B. licheniformis* in the IMS solution during 21 days storage at 4 and 10ºC.

9.1.6. Higher holding temperature of pasteurization would produce a better hurdle effect with the antimicrobial activity of nisin against *B. licheniformis* in the IMS solutions compared to longer holding time of pasteurization.

9.2 Recommendations

9.2.1 This study was concentrated to investigate the effect of main milk components, including milk fat, lactose, casein and whey protein. A further study that involved the effect of minerals on the activity of nisin against *Bacillus* spp. would be interested to carry out, since the molecule of nisin was a positive charge compound (Breukink and de Kruijff, 1999).

9.2.2 In this study, a storage period of 21 days was applied in most of the experimental section. However this studied storage period could not clearly display the effectiveness of nisin against spore and thermoduric *B. licheniformis* in some of the experimental sections. Therefore, a longer storage period was needed to be done to have a better understanding whether nisin could kill these bacteria forms or only inhibit their multiplication.

9.2.3 During the storage period of milk or IMS solutions, samples for each of the treatment replicates were taken from one container bottle throughout the studied storage period. Since this sampling method could affect the environmental condition and the composition of the nutrition in the treatment solution, a sampling method that separated the treatment solutions into small batches at the beginning of the storage period could be carried out to confirm the result of this study.

9.2.4 Applying a pour plate method would take 2 to 3 days incubation until the microorganisms produced visible colonies. Another microbiological method using a microscope could be applied to measure the number of microorganisms in milk sample and reduce the incubation time.