CHAPTER VI

CONCLUSIONS AND RECOMMENDATION

6.1 Conclusions

This study developed the porous scaffolds, composed of gelatin and collagen, prepared from freeze drying and dehydrothermal (DHT) crosslinking techniques. The effects of gelatin type, solution concentration, blending composition and DHT treatment time on chemical, physical and biological properties of the scaffolds were investigated. Crosslinking degree of the scaffolds was different depending mainly on gelatin type, blending composition and DHT treatment time. It was found that type A gelatin scaffolds could be crosslinked more than type B and pure collagen scaffolds could be crosslinked with the least degree. The difference in crosslinking degree of each scaffold was the result of the difference in initial free amino group content of various biomaterial types. Gelatin type and solution concentration also influenced on the morphology of the scaffolds. Morphology of type A gelatin scaffolds had more porosity than that of type B gelatin and collagen/gelatin scaffolds. In addition, scaffolds obtained from low solution concentration provided the fiber-like structure while the ones obtained from high solution concentration provided the membrane-like structure with interconnected pores. Considering the physical property, collagen blending improved the compressive modulus and the swelling ability of gelatin scaffolds by the advantage of its triple helix structure. However, all blending compositions of collagen/gelatin scaffolds showed no significant difference. The *in vitro* biodegradation test reported the remaining weight of collagen/gelatin scaffolds after incubating in lysozyme solution. The results revealed that collagen blending decreased the degradation of gelatin scaffolds within a day for gelatin scaffolds to a couple weeks for collagen/gelatin scaffolds. Nevertheless, all blending compositions of collagen/gelatin scaffolds still showed no significant difference. The results from *in vitro* cell culture confirmed the biological properties of collagen/gelatin scaffolds that the reduced amount of used collagen by 70%, 80% and 90% would not affect the cell

response. Mouse fibroblasts could both attach and proliferate on all collagen/gelatin scaffolds with the comparable number of cells comparing to pure collagen scaffolds.

In conclusion, gelatin could be used to partly replace collagen for scaffold fabrication. All blending composition of collagen/gelatin scaffolds (CG10/90, CG20/80 and CG30/70), which had acceptable physical and biological properties, still possessed comparable cell proliferation property to that of collagen scaffolds. Therefore, a large amount of collagen used in scaffold fabrication could be reduced leading to a much lower cost of biomaterials used.

6.2 Recommendations

Although the effects of gelatin type, solution concentration, blending composition and DHT treatment time on chemical, physical and biological properties of the collagen/gelatin scaffolds have been investigated in this work, there are other interesting points which should be further considered as following:

1. Suitable GAG, such as chitosan, should be blended with collagen and gelatin to produce chitosan/collagen/gelatin scaffolds in order to make the scaffolds more likely the natural ECM in dermis, better biological properties and slower degradation rate.
2. The adaptation of crosslinking technique should be employed to extend the lifetime of the scaffolds.