CHAPTER V

CONCLUSION

Electrospinning of silk fibroin fibers from *Bombyx mori* was studied with a focus on the appropriate condition to produce the fibers with extremely small diameters in the range of nanometers, using formic acid as a solvent at various applied voltages and concentrations of the silk fibroin solution. The structural characteristics, thermal properties, and morphology of the electrospun silk fibroin fibers were investigated through Fourier transform infrared (FTIR) spectroscopy, thermogravimetry analysis (TGA), and scanning electron microscopy (SEM), respectively. In addition, two types of scaffolds, elctrospun fibrous mats and films, were fabricated for the Schwann cell culture. The cytotoxicity tests, the attachment, and the proliferation between Schwann cells and scaffolds were examined by the MTT assay. The determination of Schwann cell morphology on the scaffolds was also examined by SEM. The conclusions and suggestions were categorized as follows ;

1. The concentration of silk fibroin solution and the applied voltage that could produce the silk fibroin continuous nanofibers without the presence of bead defects were 50 % w/v and 25 kV, respectively.

2. The thermal properties of electrospun silk fibroin fibers from TGA curve showed a greater weight loss at the temperature ranging from about 270 to 370 ^{o}C.

3. The structural characteristics of electrospun silk fibroin fibers from FTIR spectrum indicated that the electrospun silk fibroin fibers had β-sheet conformation.

4. The potential use of an electrospun silk fibroin fibrous mat and silk fibroin film as the scaffolding materials were assessed through a broad array of cytotoxicity tests in comparison with the bare wells of 96-wells culture plate as a control.

4.1) Indirect cytotoxicity test indicated that both types of scaffolds posed no threat to the cells when compared with the control due to no significant difference in the viability of the cells.

4.2) Direct cytotoxic test indicated that the scaffolds, fibrous mat and film, had direct effect on Schwann cell when compared with the control due to the fewer viable cells.

Both tests revealed that, while both types of scaffolds did not release any substance that was detrimental to the cells, the direct contact of the cells on these materials was inferior to that of the control. Consequently, the attachment and proliferation of Schwann cells on the scaffolds at different times in culture should be further investigated to clarify the cells behavior.

5. The attachment and proliferation of Schwann cells on the scaffolds were investigated in comparison with the bare wells of 96-wells culture plate as a control.

5.1) The fibrous mat scaffold exhibited much better attachment of Schwann cells than the control and film scaffold, respectively.

5.2) The proliferation of Schwann cells on the fibrous mat and film scaffold was less than that of control, although the tendency of their proliferation had continuous increased when increasing in the culture times.

According to the SEM images of Schwann cells, the result obtained suggested that Schwann cells favored the flat surface more than rough surface to maintain their phenotypes.

These data suggested that Schwann cells had a biocompatibility with the electrospun silk fibroin fibers and silk fibroin film. The electrospun silk fibroin fibers promoted better growth of Schwann cells in vitro than silk fibroin film did, because the electrospun silk fibroin fibers had three-dimensional structure similar to extra cellular matrix to support vascular system for oxygen or nutrient supply. However, the electrospun silk fibroin fibers should not be used as scaffold for Schwann cell culture because the Schwann cell on the electrospun silk fibroin fibers could not maintain their phenotypes. Finally, the electrospun silk fibroin fibers can be more further studied and developed to be a preferable scaffold for Schwann cell culture, for example, coating of the electrospun silk fibroin fibers with the ground substances of extracellular matrix such as collagen or hyaluronic acid.