CHAPTER V
CONCLUSIONS

Ultrafine fibers from poly(3-hydroxybutyrate) (PHB), poly(3-hydroxybutyrate-co-2-hydroxyvalerate) (PHBV) and their blends were successfully prepared by electrospinning from pure and blend solutions of the polymers in chloroform at 50°C. For a given applied electrical potential, the average diameter of the as-spun fibers from PHB and PHBV solutions was found to decrease with increasing collection distance, but it was found to increase with increasing solution concentration. With increasing solution concentration, the tendency for bead formation was also decreased. For a given solution concentration, increasing applied electrical potentail generally caused the average fiber diameter to increase and the tendency for bead formation to decrease. In all of the spinning conditions investigated, the average diameter of the as-spun PHB fibers ranged between 1.6 and 8.8 mm, while that of the as-spun PHBV fibers ranged between 1.6 and 4.7 mm, respectively. Electrospinning of PHB/PHBV blends was carried out at a fixed total solution concentration of 14 wt.% on a home-made rotating cylindrical collector. Rather well-aligned, cross-sectionally round fibers without beads were obtained. The average diameter of the as-spun pure and blend fibers ranged between 2.3 and 4.0 mm. A higher SEM magnification revealed indentations on the fiber surface. Interestingly, the as-spun fiber mats appeared to be more hydrophobic than the corresponding films. Mechanically, much improvement in the tensile strength and the elongation at break was observed for the blend fiber mats over those of the pure fiber ones. Lastly, the applicability for the electrospun fiber mats of PHB, PHBV, and their blends to be used as bone scaffolds was evaluated by an indirect cytotoxicity test, adhesion test, and proliferation test using human osteoblasts (SAOS2) and mouse fibroblasts (L929) as reference cells. It was found that all of the fibrous scaffolds promoted much better adhesion and proliferation of cells than the corresponding solution-cast film scaffolds. Moreover, selected scanning electron microscopy (SEM) images showed that SaOS2 cells maintained their phenotype during the cell culture. These results implied a high potential for use of these fiber mats as bone scaffolds.