

CHAPTER VII

SUGGESTIONS AND FUTURE WORKS

Biosurfactants are surface-active microbial products that have numerous industrial applications. Recent advances include the identification of the structural genes for a second lipopeptide, and the isolation of a gene responsible for enhanced emulsification activity of a high molecular weight biopolymer. New insight has also developed in the regulatory mechanisms of the originally described biosurfactants, both of which are controlled by quorum sensing, a mechanism bacteria use to monitor cell density. However, several structural and regulatory genes have been identified for the production of only a few biosurfactants. Similarly, numerous mutants defective in biosurfactant production have been described but not genetically analyzed. Until recently, only the gene sequence of the glycolipid rhamnolipid, produced by the gram positive bacterium *Pseudomonas aeruginosa*, and the lipopeptide surfactin, produced by *Bacillus subtilis*, had been determined. Then, the structural diversity of biosurfactants produced by different genera implies that the molecular genetics required for their production will be equally dissimilar. An understanding of the structural and regulatory genes for biosurfactant secretion would facilitate the development of cost-effective methods for industrial-scale production, and the ability to genetically engineer their structures for specific application.

Future work should be done in order to identify the biochemical pathways required to form the molecule. Regulatory genes have only been identified for glycolipid. An interesting observation from the current literature is that both are regulated by quorum sensing, a mechanism bacteria use to monitor cell density. This

was not predicted, considering their structural differences (glycolipid versus and lipopeptide) and the phylogenetic diversity of the bacteria that produce them (gram negative versus gram positive). Isolation and characterization of other biosurfactant genes is required to establish if quorum sensing is a common environmental cue which stimulates biosurfactant production.