Production of multimeric antifreeze proteins in recombinant Escherichia coli

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Antifreeze proteins (AFPs) have been significantly attracted due to their potential applications in a wide variety of industries from medicine and veterinary science (cryopreservation), through agriculture (genetic engineering) to the frozen-food industry. In this study, synthetic type I AFPs were designed as multimeric structures and produced by Escherichia coli, an ideal host for the large-production of heterologous proteins. In this investigation, the genes of AFPs were artificially synthesized by a codon usage optimized program and constructed as 4-mer. The functional AFPs were expressed at a high level by a protease deficient host, E. coli M15. These results show opportunities for the design and synthesis of novel ice-growth-inhibiting and antifreeze compounds. This study provides an efficient tool to produce recombinant food peptide additive at a high level and overcomes the problem of natural resources limitation as well. [This work was supported by the Basic Science Research Program (2010-0008826) through the National Research Foundation of Korea funded by the Ministry of Education, Science and Technology]