Baculovirus Polyhedrin as a Fusion Partner for Formation of Inclusion Body in *Escherichia coli*

Jeong Hyun Seo[1,2], Lin Li[2,4], Joo Sang Yeo[3], and Hyung Joon Cha[1,2]*

[1]Department of Chemical Engineering & [2]Division of Molecular and Life Sciences, Pohang University of Science and Technology, Pohang 790-784, Korea

[3]Dongbu Advanced Research Institute, Daejeon, 305-708, Korea

[4]Key Laboratory of Agricultural Microbiology, School of Life Science and Technology, Huazhong Agricultural University, Wuhan 430070, China

ABSTRACT

Baculoviral polyhedrin, which originated from *Autographa califonica* nuclear polyhedrosis virus (AcNPV), was employed for the first time as a novel fusion partner for expression of foreign proteins in *Escherichia coli* system. We characterized the expression of recombinant polyhedrin protein fused to green fluorescent protein (GFP). The polyhedrin fusion protein (~58 kDa) was successfully expressed as an insoluble inclusion body comprising approximately 30% of the total cellular protein. The *E. coli* expressing polyhedrin-GFP fusion protein showed higher cell growth (~1.8-fold) and higher GFP yield (~3.5-fold) than the strain expressing soluble single GFP. Interestingly, the polyhedrin fusion portion showed almost the same characteristics as the native baculoviral polyhedrin; it was rapidly solubilized under alkaline conditions, similar to the conditions found in the insect midgut. In addition, the polyhedrin fusion portion was rapidly digested by alkaline proteases in insect *Plutella xylostella* midgut as well as by a-chymotrypsin, a protease that has similar properties to insect midgut polyhedra-associated alkaline proteases. These unique properties suggest that baculoviral polyhedrin might be an advantageous fusion partner for production of foreign proteins, especially harmful proteins, in *E. coli* expression systems.