Multifunctional Cell Regulation Activities of the Mussel Lectin SeviL: Induction of Macrophage Polarization toward the M1 Functional Phenotype

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Abstract

SeviL, a galactoside-binding lectin previously isolated from the mussel *Mytilisepta virgata*, was demonstrated to trigger apoptosis in HeLa ovarian cancer cells. Here, we show that this lectin can promote the polarization of macrophage cell lines toward an M1 functional phenotype at low concentrations. The administration of SeviL to monocyte and basophil cell lines reduced their growth in a dose-dependent manner. However, low lectin concentrations induced proliferation in the RAW264.7 macrophage cell line, which was supported by the significant up-regulation of TOM22, a component of the mitochondrial outer membrane. Furthermore, the morphology of lectin-treated macrophage cells markedly changed, shifting from a spherical to an elongated shape. The ability of SeviL to induce the polarization of RAW264.7 cells to M1 macrophages at low concentrations is supported by the secretion of proinflammatory cytokines and chemokines, as well as by the enhancement in the expression of IL-6- and TNF-α-encoding mRNAs, both of which encode inflammatory molecular markers. Moreover, we also observed a number of accessory molecular alterations, such as the activation of MAP kinases and the JAK/STAT pathway and the phosphorylation of platelet-derived growth factor

receptor-α, which altogether support the functional reprogramming of RAW264.7 following SeviL treatment. These results indicate that this mussel β-trefoil lectin has a concentration-dependent multifunctional role in regulating cell proliferation, phenotype, and death in macrophages, suggesting its possible involvement in regulating hemocyte activity in vivo.