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ORIGINAL ARTICLE

Anti-inflammatory effect of lysozyme from hen egg white on mouse peritoneal macrophages

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Abstract Lysozyme from hen egg has been reported to possess an anti-inflammatory effect. However, little is known about its detailed mechanism. The mechanism of anti-inflammatory effect of lysozyme was examined in this study. When mouse macrophage-like cell line RAW264.7 cells and mouse peritoneal macrophages were activated with lipopolysaccharide (LPS) and then treated with lysozyme, the production of tumor necrosis factor-α and interleukin-6 was significantly suppressed. The effect was induced by suppressing the gene expression levels of both cytokines. Phagocytosis activity of peritoneal macrophages was not altered by the treatment with lysozyme, suggesting that lysozyme shows the anti-inflammatory effect without inhibiting the phagocytotic response of macrophages. In addition, lysozyme inhibited phosphorylation of c-jun N-terminal kinase (JNK) and was taken up by macrophages within 1 h after treatment of the cells with lysozyme. Overall results suggest that lysozyme is taken up intracellularly and suppresses LPS-induced inflammatory responses by inhibiting JNK phosphorylation.

Keywords Anti-inflammatory effect · Lysozyme · Peritoneal macrophages · Tumor necrosis factor-α · Interleukin-6

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Introduction

In recent years, chronic inflammation closely related to the pathological base of chronic diseases such as cancer and lifestyle-related diseases has garnered attention (Coussens et al. 2013; Manabe 2011). Inflammation is a defensive reaction, which occurs when individuals are infected with pathogens such as viruses and bacteria. Leucocytes, such as macrophages and neutrophils, are related to inflammation. Macrophages are multifunctional leucocytes related to innate immunity and remove foreign substances such as bacteria and dead cells. In addition, lipopolysaccharide (LPS), a cell membrane-constituting component of gram-negative bacteria, is recognized by macrophages and promotes the release of various mediators that trigger inflammatory reactions (Kawai et al. 2001; Yamamoto et al. 2003; Sato et al. 2005). The