Allicin from garlic neutralizes the hemolytic activity of intra- and extra-cellular pneumolysin O \textit{in vitro}

M. Arzanlou\textsuperscript{a,*}, S. Bohlooli\textsuperscript{b}, E. Jannati\textsuperscript{c}, H. Mirzanejad-Asl\textsuperscript{d}

\textsuperscript{a} Department of Parasitology, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran
\textsuperscript{b} Department of Pharmacology, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran
\textsuperscript{c} Department of Microbiology, School of Sciences, Islamic Azad University, Ardabil Branch, Ardabil, Iran
\textsuperscript{d} Department of Pharmacology, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran

\textbf{A B S T R A C T}

Pneumolysin (PLY) is a key virulence factor contributes to the pathogenesis of \textit{Streptococcus pneumoniae}. In this study we investigated the effect of allicin and aqueous garlic extracts on hemolytic activity of PLY both in prelysed and intact cells. Additionally the antimicrobial activity of allicin was tested against the bacteria. All tested materials potently inhibited the PLY hemolytic activity. Allicin neutralizes PLY in a concentration- and time-dependent manner. Twenty five minute incubation of PLY (2 HU/mL) with 0.61 \textmu M/mL concentration of allicin, totally inhibited hemolytic activity of PLY (IC50 = 0.28 \textmu M/mL). The inhibitory activity of old extract of garlic was similar to pure allicin (IC50 = 50.46 \textmu M/mL; 0.31 \textmu M/mL; \textit{P} < 0.05). In contrast fresh extract of garlic inhibits the PLY hemolytic activity at lower concentrations (IC50 = 13.96 \textmu M/mL; 0.08 \textmu M/mL allicin). Exposure of intact cells to allicin (1.8 \textmu M) completely inhibited hemolytic activity of PLY inside bacterial cells. The inhibitory effect of the allicin was restored by addition of reducing agent DTT at 5 mM, proposing that allicin likely inhibits the PLY-decay. Several lines of evidence through both in vitro and in \textit{vivo} studies have revealed the potential role of PLY in the pathogenesis of pneumococcal infections.

\textsuperscript{*} Corresponding author. Tel.: +98 451 551 6367; fax: +98 451 551 2014. 
E-mail address: m.arzanlou@arums.ac.ir (M. Arzanlou).

\textbf{1. Introduction}

\textit{Streptococcus pneumoniae} causes several important human diseases, including serious invasive diseases like as pneumonia, septicemia and meningitis, in addition to otitis media and acute sinusitis (Musser, 1992). This organism produces several potential virulence factors responsible for this broad range of diseases (Mitchell, 2000). Pneumolysin (PLY) is a key multifunctional virulence factor contributes to the pathogenesis of pneumococcal diseases and produces by virtually all clinical isolates of \textit{S. pneumoniae} (Cockeran et al., 2002, 2003; Feldman and Anderson, 2009).

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