The extracts from Lotus Leaf (*Nelumbo nucifera*) prevent LPS-induced inflammatory in RAW 264.7 marcrophage through MAPK and NF-κB mediated signaling pathways

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The leaf of *Nelumbo nucifera* Gaertn., an aquatic perennial plant and cultivated in eastern Asia and India, has been widely used in the traditional Chinese herb medicine for dispersing summer heat. Previous studies have been reported the medical properties of lotus leave, including antioxidant, hepatoprotective, antiviral, immunomodulatory, and antiobesity effects. However, the pharmacological effect of lotus leave in anti-inflammatory is still unclear. This study was attempted to elucidate the effect and underlying the mechanisms of lotus leaf (*Nelumbo nucifera*) methanolic extract (NNE) protected lipopolysaccharide (LPS)-induced inflammation in murine macrophage cell line- RAW264.7 cells. NNE (150 μg/mL) significantly suppressed the protein expressions of inducible NO synthase (iNOS) and cyclooxygenase 2 (COX-2) after exposure of cells to LPS. The mRNA levels of LPS-induced pro-inflammatory cytokines (including: interleukin-6 (IL-6), IL-10 and tumor necrosis factor-α (TNF-α)) in RAW 264.7 cells were markedly reversed by pre-treatment with NNE. Moreover, NNE could inhibit the phosphorylation of mitogen-activated protein kinases (MAPKs), including extracellular signal-regulated kinase (ERK1/2) and c-Jun N-terminal kinase (JNK). Pharmacological inhibitors PD98059, and SP600125 attenuated the LPS-induced ERK1/2 and JNK activation and iNOS and COX-2 expression. The activation of nuclear factor-κB (NF-κB) translocation into the nucleus and IκBα degradation in the cytosolic fraction were also abrogated by NNE. These results suggest that NNE exhibits anti-inflammatory activities by preventing both ERK1/2- and JNK-activation mediated iNOS and COX-2 expression, and the transcription factor NF-κB signaling pathway.

Keyword: Lotus leaf (*Nelumbo nucifera*) methanolic extract (NNE); Inflammatory; Macrophage; MAPK; Nuclear factor- κB