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## Effect of *Perilla frutescens* var. *acuta* Kudo and rosmarinic acid on allergic inflammatory reactions.

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### Abstract

Allergy is characterized by an overreaction of the immune system. *Perilla frutescens* leaf extract has been reported to exhibit antiallergic inflammatory activity. To investigate precisely the effect and mechanism of 30% ethanol extract powder of *P. frutescens* var. *acuta* Kudo (EPPF) and rosmarinic acid (RA), a component of EPPF in allergic rhinitis and rhinoconjunctivitis, the antiallergic effects of EPPF and RA were analyzed using *in vivo* and *in vitro* models. Cytokine production was analyzed by means of an enzyme-linked immunosorbent assay. Cytokine expression was analyzed via reverse transcription-polymerase chain reaction and Western blotting. Transcription factor and caspase-1 activity were analyzed by a luciferase assay and caspase-1 assay, respectively. The number of nasal, ear and eye rubs after an ovalbumin (OVA) challenge in OVA-sensitized mice was significantly higher than that in OVA-unsensitized mice. Increased number of rubs was inhibited by administration of EPPF or RA. Increased levels of IgE in the serum, spleen and nasal mucosa of OVA-sensitized mice were reduced by EPPF or RA administration. The histamine level was also reduced by EPPF or RA administration in the serum of OVA-sensitized mice. Protein levels and mRNA expressions of interleukin (IL)-1 $\beta$ , IL-6 and tumor necrosis factor- $\alpha$  were inhibited by EPPF or RA administration in the nasal mucosa tissue or spleen of OVA-sensitized mice. In EPPF or RA-administered mice, the mast cell and eosinophil infiltration increase as caused by OVA-sensitization was decreased. In addition, EPPF or RA inhibited both cyclooxygenase-2 protein expression and caspase-1 activity in the same nasal mucosa tissue. In activated human mast cells, nuclear factor-kappa B (NF- $\kappa$ B)/Rel A and caspase-1 activation increased, whereas NF- $\kappa$ B/Rel A and caspase-1 activation was inhibited after a treatment of EPPF or RA. These results indicate that EPPF and RA ameliorate allergic inflammatory reactions such as allergic rhinitis and allergic rhinoconjunctivitis.

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