Hydrosol prepared from *Rosa damascena* is a candidate for therapeutic agents against superficial candidiasis

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Introduction

Hydrosol obtained from the flowers of *Rosa damascena* (rose water) has been traditionally used as skin conditioners against troubles such as erythema, itchiness and swelling. One of the causes of these troubles is microbial infection. The treatment for infectious conditions usually focuses on antimicrobial effects. However, inflammatory symptoms accompanying infection are serious under clinical conditions and therefore suppression of inflammation is also very important. Although there are anecdotal evidences regarding the efficacy of rose water, there have been few experimental studies to examine its activities. Here, we investigated its effects on the growth of *C. albicans* and other microbes, and on the function of neutrophils which play a major role in the regulation of inflammatory reactions.

Rose water

Rose water was donated from Bulgaria Rose Japan Ltd.

Content of essential oil in rose water : 0.095%

Chemical composition of essential oil

Phenylethyl alcohol :	43.65%
Citronellol :	18.24%
Geraniol :	14.83%

Inhibitory effect of rose water on mycelial growth of *C. albicans* ^{a)}

C. albicans were incubated with diluted rose water and its components for 16 h at 37°C in 5% CO₂. The mycelial growth of *C. albicans* was evaluated by measuring the OD₆₂₀ of adherent mycelial cells to plastic plates.

Rose water inhibited mycelial growth of *C. albicans* at a concentration of ca. 2.2%, and inhibited yeast growth at 50 %. It was speculated that geraniol, and possibly citronellol, may contribute to the activity of rose water.

Anti-microbial effect on other microbes

Rose water reduced viability of MRSA within 1 h, and partially suppressed the growth of *M. pachydermatis*.

Discussion

From these results, it was indicated that rose water reduced the pathogenicity of *candida* by inhibiting its mycelial growth, inhibited the growth of MRSA and *M. pachydermatis*, and attenuated neutrophil stimulation, which was involved in inflammatory responses. These activities can be explained by functions of active components in rose water such as geraniol and citronellol. These terpenoids are known to penetrate easily through the skin, so we can speculate that cutaneous application of rose water may be sufficient to suppress neutrophil activation and pathogenic invasion of these microbes in the skin. These findings suggest that rose water is a potential candidate for the treatment of superficial infection. Furthermore, as rose water suppressed activation of neutrophils prepared from young females after moderate exercise, rose water may alleviate various types of inflammation through suppression of excessively stimulated neutrophil function.

Anti-inflammatory function of rose water ^{a)}

The study was performed in accordance with the Declaration of Helsinki and was approved by the ethics committee of Teikyo University Review Board. All volunteers gave informed consent to participating in the study.

✧Neutrophil adhesion induced by TNF- α , LPS and fMLP

Human peripheral blood neutrophils obtained from healthy volunteers were incubated with stimulants and rose water for 1hr at 37°C in 5% CO₂. Neutrophil adhesion to the plates was evaluated by measuring the OD₆₂₀.

Rose water suppressed neutrophil activation induced by stimulants. The 50 % inhibitory concentration (IC₅₀) was 5–15%. It was speculated that citronellol and geraniol may contribute to the activity of rose water.

✧Expression level of the neutrophil membrane antigen, CD11b, induced by LPS and TNF- α

The expression level of CD 11b was measured using a FACSCalibur flow cytometer.

Rose water reduced the LPS- and TNF- α -induced cell surface expression of CD11b.

✧Neutrophil migration induced by IL-8 and fMLP

Rose water did not affect the migratory capacity of neutrophils with or without chemoattractant.

Anti-inflammatory function after moderate exercise ^{b)}

Healthy 6 young female volunteers belonging to basketball club run 4.5 km, and then peripheral neutrophils were collected.

Rose water suppressed neutrophil activation induced by TNF- α and IC₅₀ was 3-15 %.

Candida infection and inflammatory symptoms ~Therapeutic effects of rose water~