

Anti-bacterial and Sebum Secretion Inhibitory Effects of Fermented Pine Needles Extract



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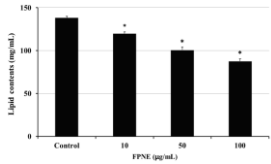
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Introduction:

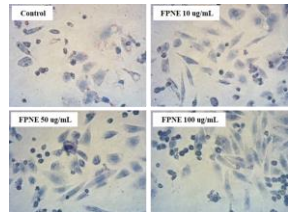
For the treatment of acne, it is necessary to develop new natural substances, not chemical agents with many side effects. *Pinus densiflora* of the family Pinaceae, commonly known as Korean red pine, is a coniferous evergreen tree that can grow up to 100 feet tall. Since ancient times, pine needles, which are leaves of pine trees, were regularly used as a folk remedy for medicine or health foods. The pine needles contain components such as bisbenzene, camphene, quercetin, kaempferol and terpene, which have been reported to have antimicrobial, antimutagenic and antioxidant effects. However, the effects of acne treatment by pine needles were not investigated. In this study, we prepared fermented pine needle extract (FPNE) to increase the physiological components and activities of pine needles. Also, we investigated the effects of FPNE on anti-bacterial and suppression of sebum secretion.

Results & Discussion:

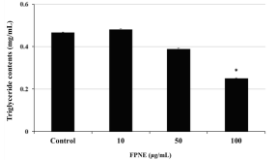
Effect on the contents of total lipid and triglyceride



Figures 5. Effect of FPNE on the total lipid content of sebocytes. Cells were treated with various concentrations of FPNE for 5 days. At the end of incubation, total lipid was measured by a lipid assay kit. The data represent the mean ± SD of triplicate experiments. *p < 0.01



Figures 6. Effect of FPNE on cytoplasmic lipid droplets formation. Sebocytes were treated with various concentrations of FPNE for 5 days. At the end of incubation, cytoplasmic lipid droplets were observed with Oil Red stain.



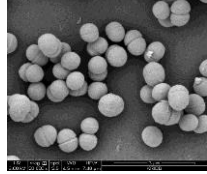
Figures 7. Effect of FPNE on the triglycerides content of sebocytes. Cells were treated with various concentrations of FPNE for 5 days. At the end of incubation, triglycerides were measured by a triglyceride assay kit. The data represent the mean ± SD of triplicate experiments. *p < 0.01

Materials & Methods:

Materials



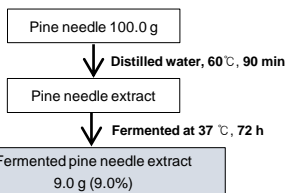
Figures 1. Korean red pine



Figures 2. Morphological Characteristics

- Scientific name : *Pinus densiflora*
- English name : Korean red pine
- Distribution : Republic of Korea, China and Japan

- Scientific name : *Pediococcus acidilactici*



Figures 3. Manufacture process

Methods

(a)

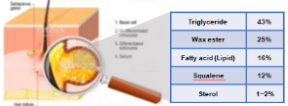
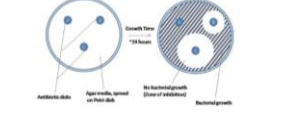


Figure 4. (a) Assay of lipid and triglyceride. Lipid and triglyceride contents were determined as the cell lysates of FPNE-treated sebocyte cells using enzyme linked immunosorbent assay (ELISA).

(b)



(b) Paper disc diffusion assay. FPNE was identified as clear zone by paper disc diffusion method using skin-related *Staphylococcus epidermidis*, *Staphylococcus aureus* and *Cutibacterium acnes*.

Anti-bacterial Effect

Table 1. Anti-bacterial effect of FPNE from *C. acnes*, *S. epidermidis* and *S. aureus* by disc diffusion assay

FPNE	Clear zone (mm)		
	<i>Staphylococcus epidermidis</i>	<i>Staphylococcus aureus</i>	<i>Cutibacterium acnes</i>
FPNE	+	+	++

+: weak inhibition (9-10 mm)
++: moderate inhibition (10-12 mm)

Conclusions:

This study shows that FPNE has the effects of anti-bacterial and inhibiting sebum secretion. Based on these results, it was suggested that FPNE can be used to treat skin diseases such as acne and dermatitis caused by excessive secretion of sebum.

Acknowledgements:

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