The antimicrobial effect of water-soluble essential oils in the nursing practice.

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Purpose

Essential oils have been widely applied for a variety of purpose. Essential oils often have antimicrobial, antioxidant and anti-inflammatory properties. When essential oils are applied as spray in daily life with the intention of removing microorganisms, they have to be dissolved in alcohol at first followed by water. In this case, it can’t be clear if antimicrobial effect could be caused by essential oils or alcohol. Therefore, this study was designed to clarify the antimicrobial effect of water-soluble essential oils dissolved with an emulsifier and investigate an application in nursing practice.

Methods

1. Evaluation of antibacterial effect
   Antibacterial effect was evaluated by measuring adenosine tri-phosphate (ATP) and adenosine mono-phosphate (AMP). ATP is a chemical substances that acts as an energy source for all living organisms on the planet. AMP is derived from ATP during the processing. The presence of ATP or AMP can be considered proof of the presence of a living organism.
   ATP + AMP was measured as follows. The tested area were wiped using the swab stick, which combines a reagent and self-contained swab device (LuciPac Pen, Kikkoman Co. Ltd. Tokyo), after which light is emitted as a result of chemical reaction between luciferase-luciferin-PPDK reagent and ATP + AMP. The level of luminescence was measured using the measuring instrument (Lumitester PD-20, Kikkoman Co. Ltd. Tokyo), and the degree of cleanliness is determined based on the amount of ATP + AMP detected by it.

2. Measurement area
   ATP + AMP were measured at a cutting board, an overflow in a bathroom, neckbands of yukata (Japanese nightclothes), which had been used for nursing skill practice several times by nursing students.

3. Used essential oil
   Tea-tree (Meliaedea alternifolia) and eucalyptus (Eucalyptus globulus) dissolved with an emulsifier were used in this study (Biken Co. Ltd. Tokyo). These water-soluble essential oils were diluted to 100 times with sterilized distilled water and used as spray.

4. Experimental protocol
   Samples were obtained by wiping up the surface of the sprayed sites to be tested using the swab stick at 30 minutes after the liquid with essential oil or without (control) was sprayed. A swab stick was moved up and down 10 times in a fixed sized area (4cm x 4cm) to wipe up. The site for spraying control liquid was about 5cm apart from the for essential oils.

5. Statistical Analysis
   The significance of difference between essential oil and control was evaluated by applying the Wilcoxon rank sum and were considered significant at p<0.05.

Results

Effects of tea-tree for a cutting board & overflow in a bathroom

<table>
<thead>
<tr>
<th></th>
<th>control</th>
<th>tea-tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>cutting board</td>
<td>5714.8 RLU (100%)</td>
<td>2716.8 RLU (47.5%)</td>
</tr>
<tr>
<td>overflow</td>
<td>24218.3 RLU (100%)</td>
<td>4444.3 RLU (18.3%)</td>
</tr>
</tbody>
</table>

The antimicrobial effect of essential oils in the nursing practice.

Effects of tea-tree & eucalyptus for neckbands in yukata

<table>
<thead>
<tr>
<th></th>
<th>control</th>
<th>tea-tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>tea-tree</td>
<td>224.8 RLU (100%)</td>
<td>1635.5 RLU (73.2%)</td>
</tr>
<tr>
<td>eucalyptus</td>
<td>867.8 RLU (100%)</td>
<td>333.9 RLU (38.0%)</td>
</tr>
</tbody>
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Discussion & Conclusion

The conclusions of this study suggest that the spraying of essential oils in the nursing practice,尤其是tea-tree and eucalyptus, can effectively reduce the presence of microorganisms, particularly in areas with high bacterial load, such as cutting boards, overflow in bathrooms, and neckbands of yukata. This finding implies that the use of these essential oils can serve as an effective method to maintain cleanliness and hygiene in clinical settings and further supports the practical application of essential oils in nursing practice.