Which Essential Oil is Better for Hygienic Massage Practice?

Article

Nozomi DONOYAMA, MS, Yoshitoshi ICHIMAN, PhD

Course of Acupuncture Science, Department of Health, Faculty of Health Science, Tsukuba University of Technology

Correspondence:

Nozomi DONOYAMA

Course of Acupuncture Science, Department of Health, Faculty of Health Science, Tsukuba University of Technology

4-12-7 Kasuga, Tsukuba, Ibaraki, Japan

305-0821

tel: 029-858-9631

fax: 029-855-1745

e-mail: esperance.dono@nifty.com

ABSTRACT

We examined whether it was possible to practice hygienic massage by using six essential oils—eucalyptus, lavender, niaouli, sage, tea tree, and thyme linalol—which in previous studies or anecdotally have been found to have antibacterial effects. First, to determine the inhibitory properties of the six essential oils against 4.80×10^5 colony forming units (CFU) of strain ATCC-25923 of *Staphylococcus aureus*, we used a disc method to measure the inhibition zones. Niaouli and eucalyptus showed higher growth inhibitory effects. We then examined the results of using these two essential oils in seven different massage sessions. The niaouli and eucalyptus were each diluted to 1%, 3%, or 6% v/v with jojoba oil base, and jojoba oil without any essential oil was used as a control. Bacterial samples were taken from the therapist's palms and the subject's skin, and the surviving bacteria were counted.

The antibacterial effects were correlated *in vitro* with the concentration of the essential oil, and massage sessions with niaouli oil were more hygienic than those with eucalyptus oil.

Key words: bacterial count, hygienic massage practice, niaouli oil, eucalyptus oil, antibacterial effect, *Staphylococcus aureus*

INTRODUCTION

Because the therapist's palms contact the client's skin during massage therapy, a great number of bacteria move between the therapist and the client during massage. The bacterial count on the therapist's palms has been shown to increase, and that on the client's skin to decrease, after 10 min and 20 min of massage with lubricants (Donoyama *et al.* 2004).

The antibacterial effects of many essential oils have been shown in previous studies (Deans and Ritchie, 1987; Franchomme *et al.* 1996). Massage practice could become more agreeable and safe for both the therapist and the client if the antibacterial effects of such essential oils were to be utilized in massage practice. Thus, in our previous study (Donoyama *et al.* 2005) we compared the bacterial counts on the therapist's palms and on the client's skin during massage sessions, using tea tree oil or lavender oil added to a lubricant base. Tea tree oil has been reported to have powerful antibacterial activity (Williams and Home, 1995; Williams, 1996), and lavender oil with no specifically had emphasized antibacterial activity. We found that undiluted tea tree oil and lavender oil possessed antibacterial activity against *Staphylococcus aureus in vitro*, but it was not clear whether the use of tea tree oil for massage reduced bacterial counts.

In the present study, we selected essential oils that had been demonstrated in previous studies to have antibacterial effects or that are used empirically by some aromatherapists for their anticipated antibacterial activity. We then tested the antibacterial effects of these oils during massage practice. The theme of our series of studies is to explore how massage practice can be done hygienically.

MATERIALS AND METHODS

This study consisted of Experiments I and II, both performed in December 2004.

Experiment I

For Experiment I, we investigated a number of essential oils that had been demonstrated in previous studies to have antibacterial properties. From them, we chose five whose antibacterial effects had been identified in "L'aromathérapie exactement" (Franchomme *et al.* 1996): eucalyptus *Eucalyptus globulus* (Sellar, 1992; Davis, 1995), lavender *Lavandula vera* (Anderson *et al.* 2000), sage *Salvia officinalis* (Sparavigna *et al.* 1993), tea tree *Melaleuca alternifolia* (Carson and Riley, 1993; Carson *et al.* 1995a; Williams and Home, 1995; Hammer *et al.* 1996; Williams, 1996; Anderson *et al.* 2000; Caelli *et al.* 2000; May *et al.* 2000), and thyme linalol *Thymus vulgaris linaloliferum*

(Sparavigna *et al.* 1993). Niaouli *Melaleuca quinquenervia* (Rose, 1992) was also chosen, because some aromatherapists have used this oil empirically for its putative antibacterial effects, although they are not described in "L'aromathérapie exactement". All the essential oils were organic products of Florial France (Caussols, France), imported and purchased by Aquavitae Ltd. (Tokyo, Japan). Each essential oil was added to jojoba oil *Simmondsia chinensis, Simmondsia californica nuttall* (Mitsuba Trading Company, Tokyo, Japan), which acted as a base oil for lubrication.

To determine the inhibitory effects of the six essential oils, we used a disc method (Connor and Beuchat, 1984). Paper discs (9 mm diameter) were soaked with the essential oil and placed on the surface of Trypto-soya agar (Nissui Company, Tokyo, Japan) inoculated with 4.80×10^5 colony forming units (CFU) of strain ATCC-25923 of *S. aureus*, and then incubated at 37 °C for 24 h. The sizes of the inhibition zones were then measured.

The zones of inhibition for each of seven concentrations of the essential oils were tabulated (Tab. 1). Lavender, sage, tea tree, and thyme linalol inhibited the growth of *S. aureus* only until they were diluted four times, whereas eucalyptus kept its effects until 8 times dilution and niaouli until 32 times. The jojoba base oil had no antibacterial effects. We therefore chose niaouli and eucalyptus for use in Experiment II.

Experiment II

We explored whether hygienic massage practice would be possible by adding niaouli or eucalyptus oil to a jojoba lubricant base.

Participants: A 24-year-old healthy male was recruited as the massage subject. The massage therapist was a female with a massage practitioner's national license and more than 15 years' treatment experience.

Procedure: The experimental procedures were identical to those used in Donoyama *et al.* 2004 and 2005. After the subject had entered the laboratory he lay down prone on the bed, exposing the skin below the knee joint. After he had rested for 15 min the massage began. Before giving the massage, the therapist washed her hands in accordance with the guidelines (Centers for Disease Control, 1998); she using Hibiscrub® (chlorhexidine gluconate; Sumitomo Pharmaceuticals, Osaka, Japan), brushing her nails twice under flowing water. She then wiped her hands with disposable paper towels and finally disinfected them by rubbing with Hibiscole® (chlorhexidine gluconate; Saraya Company, Osaka, Japan). The massage session consisted of direct stroking, kneading, and pressing of the skin on the posterior right lower leg and on the plantar side of the right foot for 20 min.

Seven massage sessions using different lubricant compositions were compared:

1%, 3%, and 6% eucalyptus solutions, 1%, 3%, and 6% niaouli solutions, and jojoba oil alone as a control. Each massage session was conducted on a different day.

Bacterial samples were taken from the therapist's palms using Palm stamp agar (Nikken Biomedical Laboratory Company, Kyoto, Japan) and from the skin of the subject using Food stamp agar (Nissui Company, Tokyo, Japan). Bacterial samples from the subject were taken from three 10-cm^2 points on the skin where massage was given: the plantar surface of the metatarsophalangeal joint of the large toe, the highest and thickest point of the gastrocnemius, and the center of the popliteal fossa. Bacterial samples from both the therapist and the subject were taken at three time points: before massage, after a 10-min massage, and after a 20-min massage. Bacterial samples were incubated at 37 °C for 48 h and the number of CFU was counted.

RESULTS

Fig. 1 shows the changes in bacterial count on the therapist's palms and the subject's skin before massage, after a 10-min massage, and after a 20-min massage. The bacterial count on the therapist's palms was defined as the total number of bacteria on the left and right palms, and that on the subject's skin was the total number from the three points tested. The bacterial count on the therapist's palms increased with

increasing massage duration, regardless of the oil composition. After a 20-min massage, the bacterial count on the therapist's palms was 2.65×10^2, 9.34×10^2, 3.17×10^2, 2.48×10^2, 1.80×10^1, and 4.60×10^1 for 1%, 3%, and 6% eucalyptus solutions and 1%, 3%, and 6% niaouli solutions, respectively, as compared with 4.69×10^2 using jojoba oil without essential oils (a control). Before the massage with 6% niaouli solution began, two colonies of spore-forming bacteria were found on the therapists' hands.

The bacterial count on the subject's skin decreased after massage: if the bacterial count before massage is designated as 100%, after a 20-min massage the counts were 12.5%, 7.6%, 6.3%, 0.5%, and 3.2% for 1%, 3%, and 6% eucalyptus solutions and 1% and 6% niaouli solutions, respectively, as compared with 24.6% for the control. With niaouli 3% solution no bacteria were recorded.

The relative bacterial counts on the therapist's palms and on the subject's skin were summed. The bacterial counts after a 20-min massage were 4.53, 4.48, 3.4, 1.2, 0.72, and 1.4 times as high as before massage with 1%, 3%, and 6% eucalyptus solutions, and 1%, 3%, and 6% niaouli solutions, respectively, compared with 3.6 times for the control.

DISCUSSION

In Experiment I, the minimum inhibitory concentration of the niaouli oil was a dilution of 32 times (3.125%), and that of eucalyptus oil was 8 times (12.5%). In experiment II, these essential oils were used at dilutions between 1% and 6%—those usually used for aromatherapy foot massage. The increase in bacterial count on the therapist's palms after a 20-min massage was significantly lower using the 3% and 6% niaouli solutions than with the other oils. The bacterial count on the subject's skin decreased to a significantly greater extent with niaouli oil than with eucalyptus oil. The total bacterial counts on the therapist's palms and the subject's skin after a 20-min massage using niaouli oils did not differ very much from those before the massage, whereas those after a 20-min massage with the eucalyptus oils or the control were three or four times as high as before the massage. It may have been inevitable that the bacterial count during massage with eucalyptus oil did not differ from that with the control, because eucalyptus oil diluted less than 8 times did not inhibit the growth of *S. aureus* (Tab. 1). Benouda *et al.* (1988) demonstrated that *Eucalyptus globules* was more effective against bronchial strains than against *S. aureus*. These results with niaouli oil imply that niaouli oil has antibacterial effects during massage sessions as well as *in vitro*. When tea tree oil is diluted with base oil as a massage lubricant and then used for foot massage, its efficacy is reduced (Donoyama *et al.* 2005). Carson *et al.* reported that

tea tree oil was considered an effective topical antimicrobial agent *in vitro*, with good activity against a variety of bacteria (1995b), but also pointed out that few clinical data were available to justify its use (1988). In addition, some studies have indicated that the presence of surfactants, various other interfering substances, and emulsifying agents compromise the antibacterial activity of tea tree oil (Remmal *et al.* 1993; Hammer *et al.* 1999; Cox *et al.* 2001; Inoue, 2003). We found that niaouli oil diluted with base oil for massage practice had the same antibacterial effect as that found *in vitro*. This result may be caused by a strong antibacterial effect of niaouli oil. Niaouli oil may possess some special properties that prevent its efficacy from being lost upon dilution with base oil. We are as yet unable to discuss these points, because we have found few studies on niaouli in the scientific literature. Further studies are needed.

Growth inhibition of *S. aureus* was dependent on the concentration of niaouli oil in Experiment I, but in Experiment II a greater antibacterial effect was demonstrated with 3% niaouli solution than with 6%. This result may be related to the 2 colonies of spore-forming bacteria that were present on the therapist's palms at the time she began massage with 6% niaouli solution, because such bacteria are not disinfected by ordinary disinfectants (Favero and Bond, 1991; Rutala, 1996).

It has been demonstrated that many essential oils have antibacterial effects *in*

vitro. However, various kinds of microorganisms have been included. In addition, some of these previous studies were based on anecdotal evidence. These previous studies and the two studies in our series suggest that there are few essential oils whose antibacterial properties are activated when the oils are diluted to low concentrations with base oil for massage.

We suggest that niaouli oil, which has been used empirically by aromatherapists for its anticipated antibacterial effect, inhibits *S. aureus* during massage. To assess the antibacterial effects of niaouli oil in practical massage sessions, the next study needs to use a larger sample size and detailed statistical analysis.

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Table 1.

Inhibitory Properties (inhibition zone diameter in mm) of Essential Oils against strain ATCC-25923 of *Staphylococcus aureus*

essential oil	undiluted	diluted (2-fold)					
		2	4	8	16	32	64
eucalyptus	40	27	22	13	0	0	0
lavendar	40	25	18	0	0	0	0
niaouli	60	44	40	14	12	10	0
sage	50	44	20	0	0	0	0
tea tree	36	30	16	0	0	0	0
thyme linalol	36	30	14	0	0	0	0
jojoba (base oil)	0	0	0	0	0	0	0

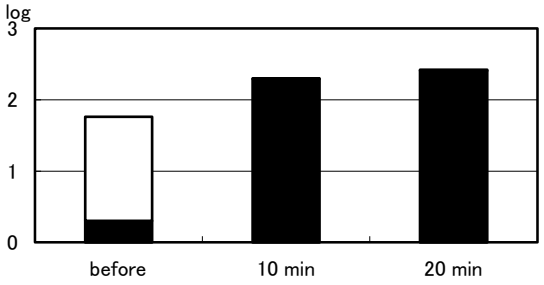

Fig. 1–a eucalyptus 1%

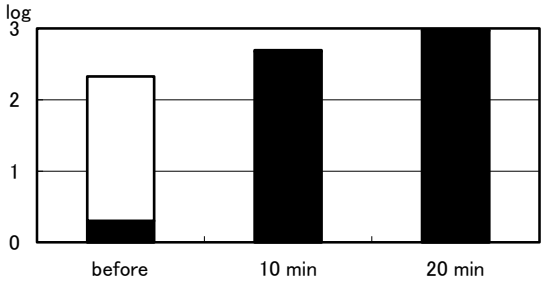

Fig. 1–b eucalyptus 3%

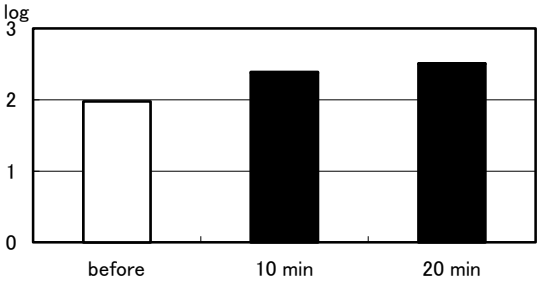

Fig. 1–c eucalyptus 6%

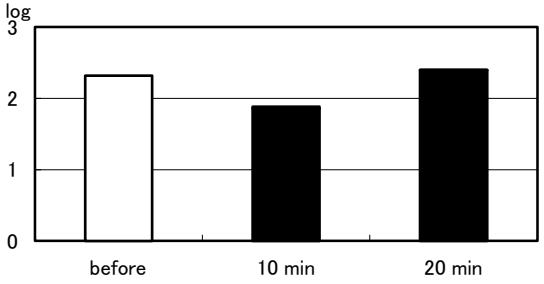

Fig. 1–d niaouli 1%

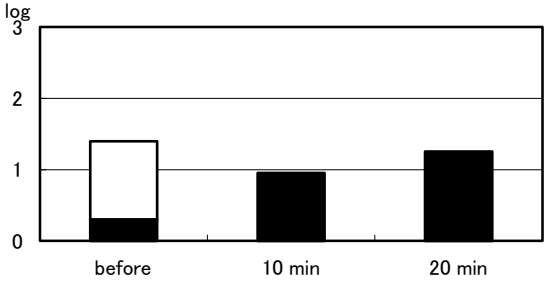

Fig. 1–e niaouli 3%

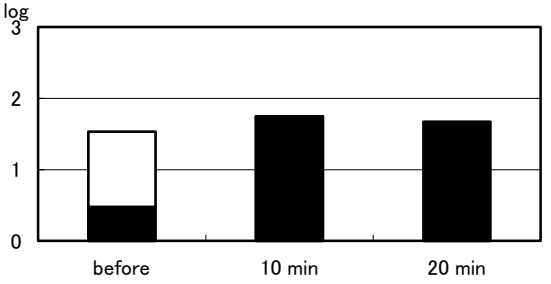

Fig. 1–f niaouli 6%

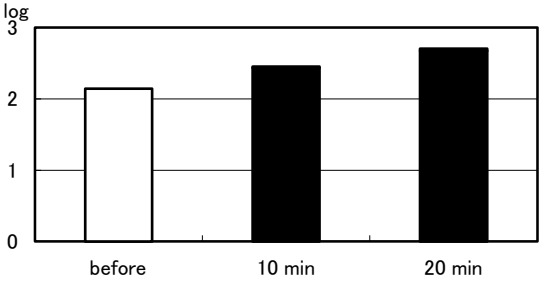

Fig. 1–g jojoba without any essential oil

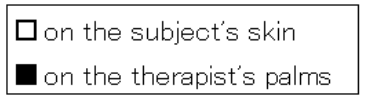

Fig. 1 Changes of Bacterial Count durring Massage Practice