A Study of the Efficacy to Control the Bacteria Colony of Scalp in Ayurvedic Oils on Clinical Testing[+]

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Abstract

This study examined the efficacy of restraining the increase of the bacteria colony of scalp according to the application of the Ayurvedic base oils and essential oils to scalp and hair. The result is as follows. The experiment illustrated that as the result of doing the paired sample t-test of a treated group and a control group according to constitutional oiling, the efficacy of the statistically significant decrease of the colony manifested in six tested groups except the group of Pitta constitution to which sesame and lavender were applied. Also, in a group that sesame was applied to Vata constitution and a group that coconut and lavender were applied to Pitta constitution, according to the passage of time, the result of being reduced the number of the colony was obtained and it showed that the oiling suitable for each constitution has the efficacy to decrease the colony of scalp. At the same time, regardless of the constitutions, the application of oils also showed the efficacy of restraining the increase of the bacteria colony of scalp. As the result of performing Paired Sample t-test for the subjective evaluation of the subjects in pre and post clinical testing, In the analysis of questionnaire that were obtained before and after the clinical testing, the results of all of the items except the item questioning a degree of inflammation appeared to be significant. That is to say, the subjects answered that a degree of keratin or a pain in scalp, an amount of sebum and a degree of hair damage were decreased after the application of oil more than before it. And in the question of a degree of hair damage, the application of oils were proved as having the efficacy to improve the hair damage.

Key Words : Ayurveda, Base oil, Essential oil, Pitta constitution, Vata constitution

Ⅰ. Introduction

Although the contemporary medical science has remarkably developed by the growth of science and technology, disease of adult people has continuously been increased and the moderns have been exposed to stress and polluted environment[1].

Hair, which is part of the skin that shows the state of one's health, is a part of the body that

is influenced first of all, when the internal balance of body is broken by stress, disease and extreme diet[2]. Hair, hence, plays an important role as a sign related with one's own health. That is why the management of hair and scalp has usually been emphasized[3]. The management and treatment of hair and scalp are mainly dependent on medical medicines that have been developed and supplied at present. However, such artificial composite things have to be taken care in their usage due to unexpected adverse reactions and toxicity[4].

Man has been dependent on magic and a natural healing power to prevent and cure diseases since he has appeared on the earth. Ancient Chinese have made use of meditation, physical exercise, breathing as well as acupuncture applying to spots on the body and India developed Ayurveda and Yoga etc. 4,000 years ago[5].

The medical system of Ayurveda, which is the oldest remedy of oral tradition, Krishna Upadiyaya Karinje[6], has been testified in the prevention and the treatment since it has been used to cure the mass of people by many doctors for ages. Eastern medicine and Indian Ayurvedic medicine make use of herbs as medicines. Especially, the management of scalp and hair in Ayurveda is done by massage after oiling[7]. This head massage, which is a branch of Ayurveda, is an effective way of remedy to relieve pain and suffering[8]. It is an age check to be attained most effectively by Ayurvedic massage with applying Ayurvedic base oils and essential oils to hair and scalp. And it is effective in curing the problems caused by stress like headache and eye strain by supplying the necessary nutriments to grow healthy hair and promoting cerebral blood circulation[9]. And among various medical efficacies of essential oils, especially, the necessity of sterilization and

preservation has been emerged for human body and everyday environment.[10] Therefore, this study researched on the efficacy of restraining the increase of the bacteria colony of scalp according to the application of Ayurvedic base oils and essential oils by a clinical testing.

II. Testing method

1. Experimental materials

1) Subjects

The subjects were classified by the constitutions such as Vata, Pitta, and Kapha though the analysis of constitution of the previous research[11] and Hair diagnostic questionnaire. As in <Table 1>, the number of cases of the types of applying oils by constitution was 2 for Vata/sesame, 5 for Vatta/sesame+geranium, 4 for Pitta/coconut, 3 for Pitta/sesame, 4 for Pitta/sesame+lavender, 4 for Pitta/coconut+ lavender, and 2 for Kapha /sesame+thyme.
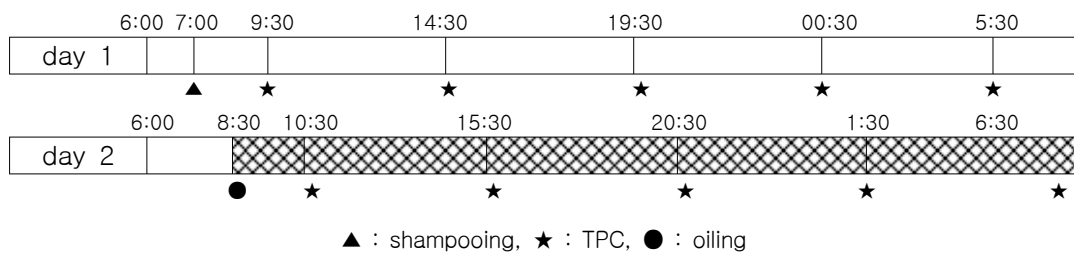
Therefore, the experiment of the application of oils by the constitution was performed to 24 subjects. Each subject participated in two experiments. The one was the experiment in which any oil was never applied(control group) and the other was the experiment in which oils was applied(treated group). The experiment was executed indoors between 20 and 25 degree Celsius and between 50 and 60 percent of humidity in the everyday life of a family.

2) Oils

The oils used in this experiment were 'L' products of 'B' company, which were the base oils and essential oils. They were used as the examples of the constitutions by diluting them to 2.5% as follows, like in <Table 1>.

<Table 1> Experimental oils for each constitution

Groups	Kind of oil	
	Base oil (B)	Base oil + Essential oil (BE)
Vata	Sesame oil (2 persons)	Sesame oil + Geranium oil (5 persons)
Pitta	Sesame oil (4 persons) Coconut oil (3 persons)	Sesame oil + Lavender oil (4 persons) Coconut oil + Lavender oil (4 persons)
Kapha		Sesame oil + Thyme (2 persons)

▲ : shampooing, ★ : TPC, ● : oiling

<Figure 1> Experimental schedule

(1) Base oil : Distilled water (20ml) + base oil (0.5ml)

(2) Base oil + Essential oil : Distilled water (19.5ml) + Base oil (0.5ml) + Essential oil (0.5ml)

3) Easy Stamp TPC

This is the sensitive method to detect bacteria, which uses Easy Stamp TPC(KM0401) Chromogenic method. The usage is as follows.

1. Open the lid of Easy Stamp and press a stamp agar on the surface of an object.

2. In case of a liquid sample, apply evenly the sample on the surface of a stamp agar by using a sterilized cotton swab.

3. Close the lid tightly and put it in the incubator between 35 and 37 degree Celsius. After 24 hours read the number of bacteria.

2. Experimental method

The experiment was executed to inquire into the effect of restraining the increase of the scalp bacteria when applying base oils and essential oils on scalp by the constitution. The method of experiment is shown below. The processes of the experiment was shown in <Figure 1>.

1) The application of oils to groups by the constitution

The application of oils to groups by the constitution was performed as follows. The application of oils was performed once below. Sesame oil was applied to 2 subjects of the Vata, sesame oil to 4 subjects of the Pitta, and coconut oil to 3 subjects of the Pitta. The total number of the subjects was 9.

In case of essential oils, sesame + geranium was applied to 5 subjects of the Vata, sesame + lavender to 4 subjects of the Pitta, and sesame + thyme to 5 subjects of the Kapha. The total number of the subjects was 15.

2) The diagnostic test for the antibiosis of scalp by the Easy Stamp

The experimental method is shown in <Figure 1>. The experiment of the Easy Stamp was performed with Easy Stamp TPC (KM0401) of 'H' company, which is a method of a high-sensitivity detection of bacteria. Also in this case, the experiment of the Easy Stamp was performed 10 times every 5 hours by the same way mentioned in the above. Shampooing was done before one and half hour from the starting of the experiment and 15ml of oils were applied evenly on scalp and hair at 8:30 on the second day. After that, they was noticed not to rinse by water. The Easy Stamp was cultured for 24 hours in the incubator between 35 and 37 degree Celsius and then the number of the bacteria was read.

3) The diagnostic test of hair and scalp by a questionnaire

Park Eun-Ha's dissertation[12] was referred to for the comparison of the change of the state of hair and scalp by the application of oils and the questions of the questionnaire were prepared in the basis of it. The subjects gave an answer to the questions before and after the experiment were done. It was executed by the questionnaire subjectively to evaluate the state of hair and scalp in pre and post experiment(control group and treated group).

3. Statistical analysis

Windows V.12.0 SPSS statistics program was used to identify the effect of restraining the increase of the scalp bacteria by applying oils to 24 subjects which participated in this clinical test. Using this program, a statistical significant difference was verified by carrying out Paired

Sample t-test between a group which oils were applied (treated group) and a group which oils were not applied.
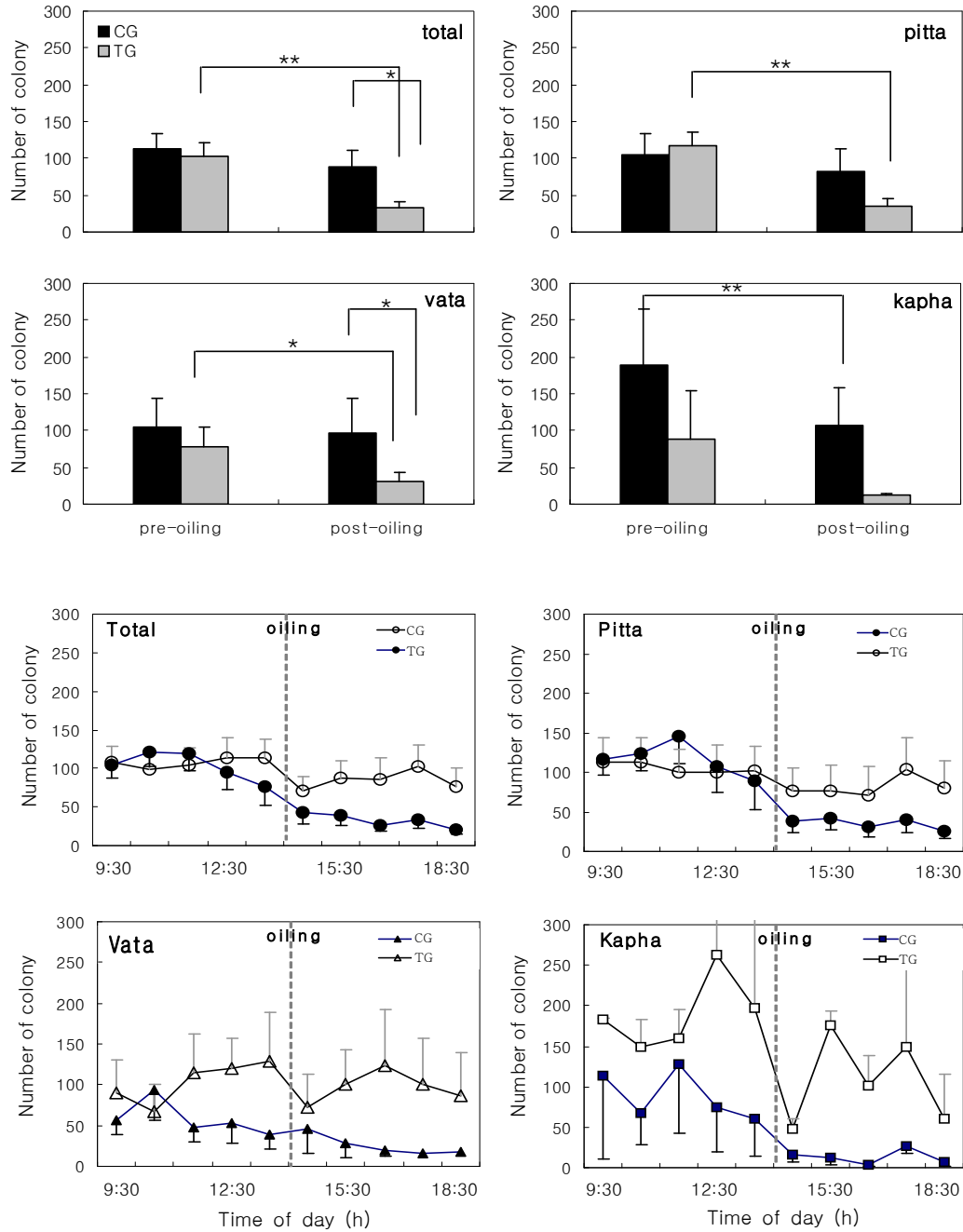
III. Result and investigation

1. Temporal Changes of the Number of the Bacteria Colony of Scalp according to the Oil Application

<Figure 2> demonstrates temporal changes of the number of colony depending on whether or not the application of oils was done to each constitution. A group that base oils were applied to scalp or that the compound oiling of base oils and essential oils were applied to scalp (treated group) showed statistically marked reduction more than a group that no oils was applied(control group) in the number of bacteria colony of scalp(paired t-test $p<0.01$). This result stands for the fact that base oils or essential oils have the efficacy to control the increase of the colony of scalp. This tendency came out statistically prominently in Pitta constitution (paired t-test $p<0.01$). Vata constitution also showed a tendency to decrease(paired t-test $p<0.01$). Kapha constitution also revealed a tendency that it was statistically significantly reduced in control group. But it is not statistically a significant result because it had only two subjects and the numbers of colony between them was remarkably different.

2. Temporal Changes of the Number of the Bacteria Colony of Scalp according to the Application of Base Oils and Essential Oils

The result of comparing the number of the bacteria colony of scalp between a group which essential oils were applied and a group which

<Figure 2> Temporal changes of number of colony for the control group
and the treated group with constitutional oil

base oils were applied regardless of the constitutions is as follows. According to <Figure 3>, it is shown that the number of colony was abated according to the passage of time, independently of constitutions, more in a group that essential oils were applied than in a group that base oils were applied. However, the statistically significant tendency of the reduction of the number of colony is revealed more in a group that base oils were applied than in a group that essential oils were applied(paired t-test p<0.1). It was in the occasion which essential oils were applied to Pita constitution more than in that which base oils were applied to it that the number of colony was significantly dwindled away(paired t-test p<0.01). After applying of oils, the number of colony was decreased more sharply in a group of Vata constitution to which essential oils were applied than in a group to which base oils were applied. Statistically, therefore, it is indicated that the number of colony was significantly diminished in that group(paired t-test p<0.1).

As the result of comparing a group that essential oils were applied independent of constitutions(treated group) with a group that any oil was not applied(control group), <Figure 4> shows that although the number of colony was diminished more in a treated group than in a control group, it did not obtain a significant result since the number of colony in both of a control group and a treated group illustrated a tendency to be reduced similarly. But as the result of comparing a group that base oils were applied independent of constitutions(a treated group) with a control group that they were not applied, the number of colony was abated significantly in a group that base oils were applied(paired t-test p<0.05).
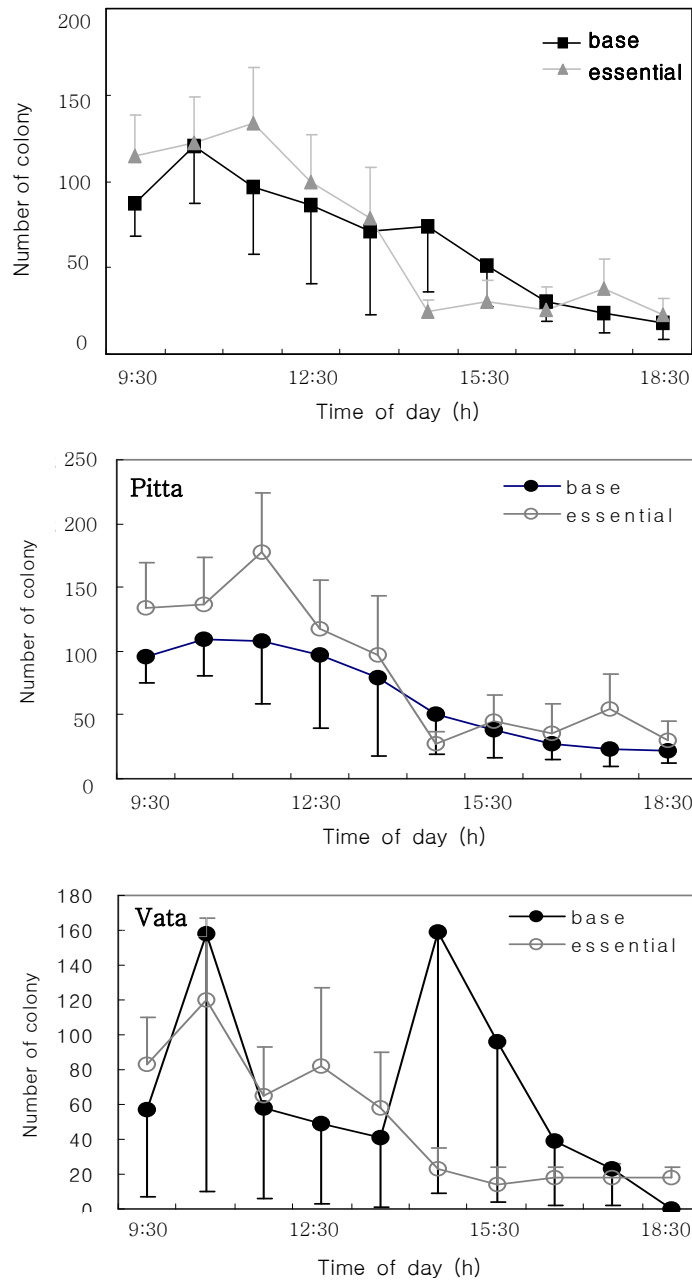
As seen in <Table 2>, as the result of

analyzing a correlation between each constitution and its number of colony according to the passage of time, a group that applied sesame to Vata constitution and a group that applied coconut and lavender to Pitta constitution showed a correlation of negativity that the number of colony was decreased according to the passage of time.

3. Temporal Changes of the Number of the Bacteria Colony of Scalp in Pitta Constitution according to various Base Oils
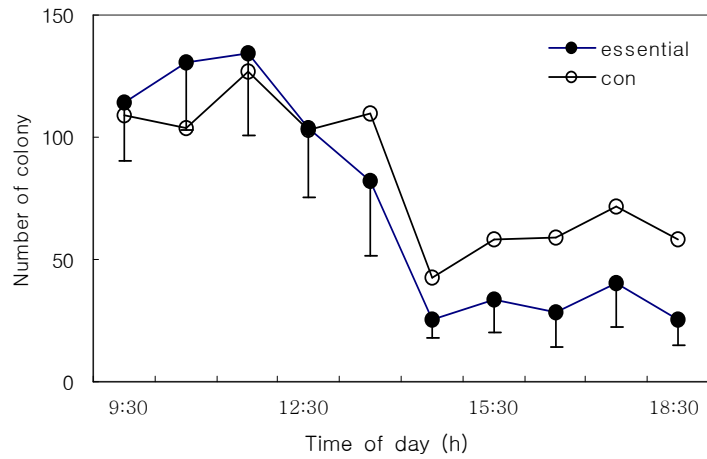
<Figure 5> is to compare between a group that applied sesame oil, which is one of base oils, to Pitta constitution and a group that applied coconut oil to it. A group that applied sesame oil indicated a tendency that the number of colony was decreased after it was increased temporarily. On the other hand, the number of colony in a group that applied sesame oil was reduced generally according to the passage of time. However, since two base oils did not have a correlation of negativity which the number of colony is decreased according to the passage of time, it was not shown as having a significant result. As the result of comparing each of them with a group that no oil was applied(a control group) respectively, in comparing the mean value, it was identified that the number of colony in a treated group was less than that in a control group. But all of sesame oil and coconut oil were not significantly different with a control group.

4. Temporal Changes of the Number of the Bacteria Colony of Scalp according to various Essential Oils

<Figure 6> is to compare between a group that essential oils were applied (treated group) and a group that they were not applied(control

<Figure 3> Temporal changes of number of
colony according to base oil and essential oil
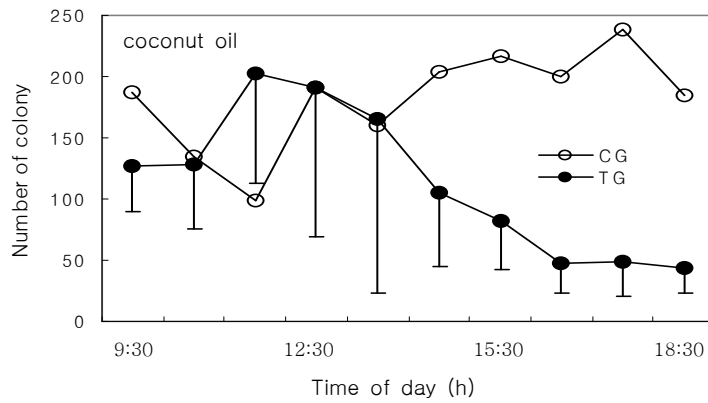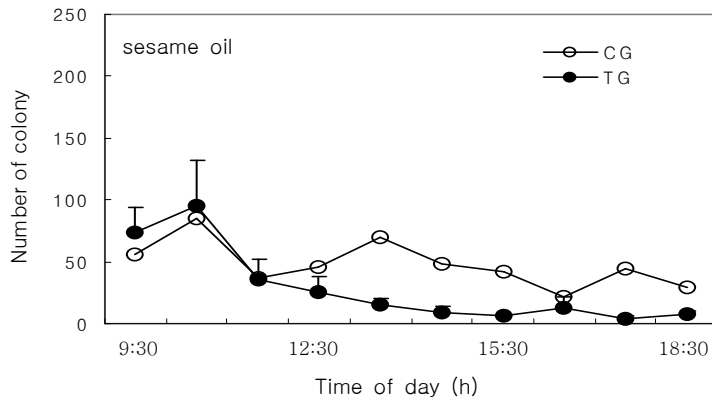
<Figure 4> Temporal changes of number of colony according
to the application of essential oil (top) and base oil (bottom)

<Table 2> The correlation between the time of examination and the number
of constitutional colony after oiling experimental group

	the time of examination	vata		pitta				kapha
		sesame	sesame+ geranium	coconut	sesame	coconut+ lavender	sesame+ lavender	sesame+ thyme
the correlation coefficient of Pearson	1.000	−.914*	−.323	−.693	−.216	−.941*	.458	−.050
significance probility (both sides)	.	.030	.596	.195	.727	.017	.438	.936
total	5	5	5	5	5	5	5	5

*p<0.05, **p<0.01

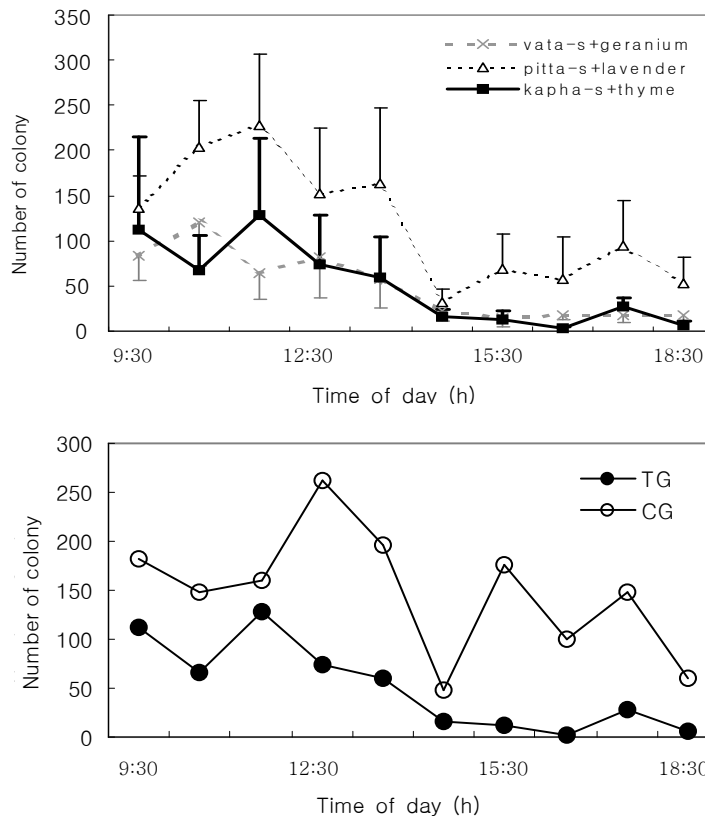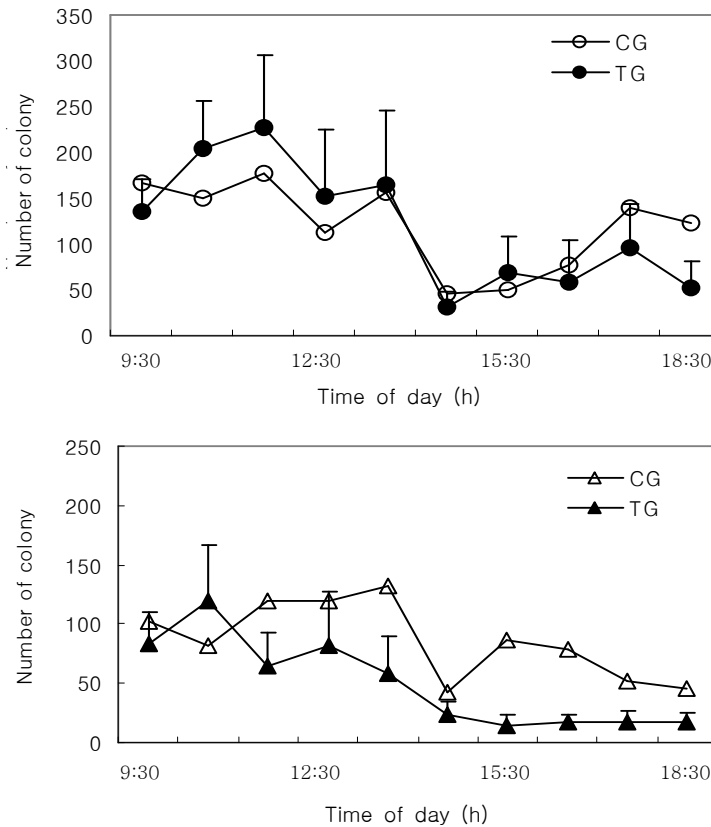<Figure 5> The time course of number of colony by
kind of base oil in pitta constitution.

group). A group that applied sesame and geranium to Vata constitution demonstrated that the number of colony was significantly decreased more than before their applications (paired t-test p<0.01). In consequence of comparing with a control group, it is identified that the mean value of the number of colony lowered. However, although it was recognized by this consequence that the number of colony was declined, it does not seem to be statistically any significant result. A group that applied sesame and lavender to Pitta constitution was reduced in the number of colony more than before they were applied. According to it, it was ascertained that the application of oils has the effect to restrain the increase of the bacteria colony of scalp (paired

t-test p<0.05). As the result of comparing with a control group, there was no a significant difference between them. As a group that applied sesame and thyme to Kapha constitution was declined more sharply in the mean value of the number of colony after they were applied than before the time, it appeared as having a significant result(paired t-test p<0.01). That is to say, it was proven that there is the efficacy of restraining the increase of the bacteria colony of scalp as the result of comparing between before and after the application of oils. It was known in comparing with a control group that it has not a significant difference. This can be considered as not having an influence on a meaningful probability of a result value due to lack of examples.

<Figure 6> Time course of number of colony by kind of essential oil

<Figure 6> Time course of number of colony by kind of essential oil (Continued)

5. Subjective Diagnosis of Hair and Scalp according to the Application of Base Oils and Essential Oils

38 respondents participated in the clinical tests of the experiment. Among them, firstly, 24 persons responded in these clinical tests and additionally, 14 respondents entered into the tests afterward. The age group between 20 and 24 had the most distribution in these clinical tests(57.9%). Among types of skin, dryness was answered by 42.1% of respondents and 31.6% of respondents were replied as having combination skin. In the others of the symptoms, it was acne to get the most selections by the respondents(39.5%), since the most respondents were young. Next selection was keratin and at the same time, 21.1% of respondents returned as not having any skin disease.

The most respondents did not have experienced a medical treatment but the respondents who experienced it have used anti-dandruff shampoo (26.3%). The number of times to experience an efficiency of massage did not obtain a significant result due to a low rate of the response. However, the most respondents replied that it was twice(18.6%). <Table 3> refers to the result of the frequency analysis regarding to the clinical testing of respondents who participated in it.

<Table 3> Result of frequency from clinical testing

		frequency
age	20 below	11(28.9%)
	20~24	22(57.9%)
	25~30	3(7.9%)
	more than 30	2(5.3%)
skin type	cradle cap	7(18.4%)
	neutrality, dry skin	16(42.1%)
	combination	12(31.6%)
	the others	1(2.6%)
	no answer	2(5.3%)
skin disease	acne	15(39.5%)
	keratin	9(23.7%)
	genetic loss of hair	1(2.6%)
	temporary loss of hair	1(2.6%)
	atopy	1(2.6%)
	other skin disease	1(2.6%)
	nothing	8(21.1%)
	no answer	2(5.3%)
the experience of remedy	existence	4(10.5%)
	non-existence	34(89.5%)
the method of remedy	nothing	26(68.4%)
	anti-dandruff shampoo	10(26.3%)
	medicinal shampoo	2(5.3%)
the number of times to experience an efficiency of massage	once	6(15.8%)
	twice	7(18.4%)
	three times	1(2.6%)
	no answer	24(63.2%)
total		38(100%)

As the result of performing the correlative analysis of age, skin types, skin diseases, a remedy for the dandruff, the number of times to experience an efficiency of massage and constitutions, the correlation coefficient value between skin types and the number of times to experience an efficiency of massage appeared 0.690 in 0.01 of a significant level. Therefore, it was known that the correlation of each item is close. Moreover, the correlation coefficient value between age and constitutions and between skin diseases and a remedy were 0.338 and -0.338 respectively. They were found as being in a significant relation as the result of comparing with a significant level i.e., 0.05.

In other words, as seen in <Table 4>, an efficiency of massage was increased or decreased according to skin types of subjects

and the number of times to massage. According to age, the change of constitution was brought about and according to different skin symptoms proper remedies for them were used.

As the result of analyzing crisscross the constitutions according to age, 27.3% of respondents who are lower than 20 years old belonged to a group of Vata constitution to which sesame was applied, 27.3% of them belonged to a group of Vata constitution to which sesame and geranium were applied and again 27.3% appertained to a group of Pitta constitution to which sesame was applied. In the respondents who are between 20 and 24 years old, a group of Pitta constitution to which sesame

and lavender were applied was exhibited as having the most distribution(22.7%). A group of Vata constitution to which sesame was applied and a group of Pitta constitution to which sesame was applied, which illustrated equally 18.2%, were the next. One person of the respondents between 25 and 30 years old were distributed respectively in a group of Vata constitution to which sesame was applied, a group of Pitta constitution to which coconut and lavender were applied and a group of Pitta constitution to which sesame was applied. The result of the cross analysis of constitution based on age is illustrated in <Table 5> as follows.

<Table 4> Analysis of correlation

		age	skin type	skin disease	the method of disease	the number of efficiency	constitution
age	the correlation coefficient of Pearson	1.000	.129	−.021	.089	.464	.338*
	total	38	36	36	38	14	38
skin type	the correlation coefficient of Pearson	.129	1.000	.037	−.286	.690**	−.100
	total	36	36	34	36	14	36
skin disease	the correlation coefficient of Pearson	−.021	.037	1.000	−.338*	.384	.038
	total	36	34	36	36	13	36
the method of disease	the correlation coefficient of Pearson	.089	−.286	−.338*	1.000	−.270	−.123
	total	38	36	36	38	14	38
the number of efficiency	the correlation coefficient of Pearson	.464	.690**	.384	−.270	1.000	.397
	total	14	14	13	14	14	14
constitution	the correlation coefficient of Pearson	.338*	−.100	.038	−.123	.397	1.000
	total	38	36	36	38	14	38

*p<0.05, **p<0.01

<Table 5> Cross-tabulation analysis of constitution based on age

	vata		pitta				kapha	total
	sesame	sesame+ geranium	coconut	coconut+ lavender	sesame	sesame+ lavender	sesame+ thyme	
20 below	3(27.3%)	3(27.3%)	1(9.1%)	1(9.1%)	3(27.3%)			11(100%)
20~24	4(18.2%)	3(13.6%)	2(9.1%)	2(9.1%)	4(18.2%)	5(22.7%)	2(9.1%)	22(100%)
25~30		1(33.3%)		1(33.3%)	1(33.3%)			3(100%)
more than 30						2(100%)		2(100%)
total	7(18.4%)	7(18.4%)	3(7.9%)	4(10.5%)	8(21.1%)	7(18.4%)	2(5.3%)	38(100%)

<Table 6> Examination of corresponding sample

		average	N	the mean error of average	the degree of freedom	t	significance probability
keratin	pre-oiling	2.58	38	.16			
	post-oiling	2.03	38	.13			
	pre-oiling -post-oiling				37	3.076	.004
pain	pre-oiling	1.87	38	.15			
	post-oiling	1.55	38	.13			
	pre-oiling -post-oiling				37	2.407	.021
infection	pre-oiling	1.95	38	.16			
	post-oiling	1.68	38	.13			
	pre-oiling -post-oiling				36	1.535	.134
sebum	pre-oiling	2.76	38	.17			
	post-oiling	2.21	38	.16			
	pre-oiling -post-oiling				37	2.948	.006
hair damage	pre-oiling	3.16	38	.15			
	post-oiling	2.45	38	.15			
	pre-oiling -post-oiling				37	4.879	.000

For the subjective examination of the subjects before and after the clinical testing, paired sample t-test was executed. This statistical method is done to compare the correlation of samples test between pre and post experiment of the same group.

As the result of performing the paired sample t-test of the data of pre and post clinical test, as seen in <Table 6>, it was observed that the result values of all items are significant, except

inflammation. That is to say, as the result of applying oils, an efficiency of improvement was perceived in the keratin on scalp, pain, the amount of sebum and degree of hair damage. This agrees with the results obtained by Park Eun-Ha[13], which showed the significant results in pain, the amount of sebum, degree of keratin and degree of hair damage by analyzing an efficiency of anti-dandruff in pre and post oiling according to items. Through the comparison of

the mean values of pre and post of test, it was known that the mean value of each item in post-applying was lower than in pre-applying. And in the questions of inquiring keratin, itching, pain, inflammation, sebum and degree of damage, the mean value of a degree of damage became low from 3.16 to 2.45 after applying. Therefore, it is understood that the application of oils has the efficacy to mitigate a degree of hair damage.

IV. Conclusion

This research examined the efficacy of Ayurvedic oils on the bacteria colony of scalp appeared in Korean women's scalps by a clinical test depending on Ayurvedic constitutional analysis. It analyzed the effect of restraining the increase of the colony after applying oil to their scalps and hair on the basis of constitution. The result is as follows.

As the result of comparing between an experiment group of the oil application to each constitutions by the experiment and the control group, colonies which reside in head were decreased in the rest six groups except a group of the application of the sesame+lavender to Pitta constitution.

As the result of the analysis of a correlation between the number of colony and the passage of time after oils were applied to each constitutions, a group which applied sesame to Vata constitution and a group which applied coconut+lavender to Pitta constitution showed a correlation of negativity that the number of colony was decreased according to the passage of time.

In the analysis of data that were obtained before and after the clinical testing, the results of the items except a degree of inflammation appeared to be significant. That is to say, a degree of keratin or a pain in scalp, a amount of sebum and a degree of hair damage were improved after the application of oil.

As the result of this experiment, the efficacy of restraining the increase of the bacteria colony of scalp was shown by using base oils individually. Therefore, it is clear that the Ayurvedic program which uses base oils individually helps to maintain the health of scalp and hair. By the result that the number of the bacteria colony of scalp according to the passage of time was reduced in a group that sesame was applied to Vata constitution and a group that coconut and lavender were applied to Pitta constitution, it is evident that the oiling suitable for each constitution has the efficacy to decrease the colony of scalp. Also, it has been known that Ayurvedic oils have the efficacy to decrease the number of the bacteria colony of scalp, by the significant result that regardless of the constitutions, the application of oils controls the increase of the bacteria colony of scalp.

However, this study has a difficulty in the generalization of applying the results of experiment to the whole Korean women because the reagents are specific young ladies and their numbers are not many. So it should be supplemented by the following research which the number, age and region of the sample group are extended.

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