

Prevalence of Demodicidosis among Residents in Taegu City*

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=國文抄錄=

大邱市 住民들에 있어서 毛囊蟲의 有病率

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사람의 皮膚에 寄生하여 여드름, 眼瞼炎 및 毛囊炎을 일으키는 毛囊蟲의 感染狀과 種類, 發生段階別 比率을 알아보기 위해 1989年 8월부터 1990年 9월까지 大邱市 赤十字社夏季學校 學童, 大學生 및 住民을 調査對象으로 選定하여 調査하였다.

調査對象者는 就寢前에 두장의 scotch tape(50×18mm)을 顔面의 코를 中心으로하는 三角部에 附着한 다음 다음날 起床 直後에 tape를 떼어 slide glass에 附着하였다.

Demodex species의 同定에는 Desch 및 Nutting(1972)法에 準하였다.

總被檢者 604名中 毛囊蟲 有病率은 51.7%였으며, 性別感染率에 있어서는 男性은 52.5%, 女性은 50.4%로 男性이 女性에 비해 그 率이 약간 높았다. 年齡群別 感染率에 있어서는 15-19歲群에서는 男性에서는 69.1%, 女性에서는 68.6%로 가장 높았다.

*Demodex*가 檢出되는 標本에서 形態를 區分할 수 있는 389마리를 Desch 및 Nutting法에 依據하여 種을 同定하였던 바 모두 *Demodex folliculorum*이었으며, 이 가운데 암컷은 49.1%, 숫컷 31.7%, 幼蟲 12.2%, 若蟲 7.3%였다.

以上の 成績으로 미루어보아 大邱市 住民들에서의 毛囊蟲 感染率은 아직도 높음을 알았다.

Key words: Demodicidosis, *Demodex folliculorum*, Prevalence, Taegu city.

Introduction

Since Simon(1842) provided the first description, which included some measurements with illustrations and indicated that both long and short forms were present in his sample of *Acarus folliculorum*, many investigators have made studies on the biology and clinical manifestations associated with demodi-

cids, and on the incidence of *Demodex* species in man.

As a result, the hair follicle mite, *D. folliculorum* and *D. brevis* is shown to be a ubiquitous obligatory ectoparasite of man that is found in hair follicles and in meibomian and sebaceous glands, involving particularly the face, nose, lips and forehead, and is observed in people of almost all ages and racial, and geographic groups.

* The results of this study were presented at the 31th annual meeting of the Korean Society for Parasitology in 1989.

Although there were many published reports in clinical, therapeutic and epidemiological literature on *Demodex* species in several parts of the world (Gmeiner, 1908; Hirst, 1919; Fuss, 1933; Spickett, 1961; Akbulatova, 1963; Norn, 1970 and 1971; Orru et al., 1972; Nutting and Green, 1976; and Aylesworth and Vance, 1982), relatively few studies on hair follicle mites in Korea have been published (Park et al., 1969; Chin et al., 1974; Kim et al., 1976; Park and Kook, 1978; Byun et al., 1983).

Data on the incidence and distribution of demodectic infestation in Korea are limited. Previous studies, largely based on small population samples, have shown variable results depending on the selection of the population and choice of methods. There are as yet no comprehensive data on demodectic infestation among residents in Taegu city, Korea, but laboratory reports from hospitals and clinics suggest a high incidence rate.

This survey deals with the incidence and distribution of these two species of *Demodex* in residents of Taegu city.

Materials and Methods

During the period from August, 1989 to October, 1990, randomly selected summer school children of the Red Cross Society, Keimyung University students and the general population of Taegu city were studied.

Pertinent data on each individual regarding sex and age were obtained prior to the survey.

An adhesive cellophane impression technique was used to survey for the presence of *Demodex* species. The scotch tape used was 90mm in length by 18mm in width. The adhesive side of the tape was put on a slide in the laboratory prior to use. They were stripped from the slide and the adhesive side was applied to the nasolabial folds and forehead.

The preparations were made from each individual in the night (2200 to 0600) in the summer schools and during the visits to the households.

The preparations, collected in a moist chamber, were brought to the Department of Parasitology labo-

ratory.

Prior to microscopy the greater part of the adhesive cellophane was detached from the slide. One drop of xylene employed for microscopy was placed on the slide close to the junction of slide and tape, after which the tape was again returned by a slight pressure along the smooth upside of the tape, and examined for the determination of number and species of *Demodex* under a binocular microscope.

The keys of morphological characteristics of *Demodex folliculorum* and *D. brevis* are as follows:

Demodex folliculorum (Simon, 1842)

Adult worm is a microscopic mite, measuring about 0.29mm in length and having an elongated, transparent body with 8 stumpy, molelike legs which have 3 joints.

The capitulum is short trapezoidal in shape. The maxillae and mandibles are styliform, and the palps are closely applied on the lower surface of the head. The abdomen is transversely striated circumferentially and tapers to the posterior rounded end.

The male sexual organ is well developed and usually projects from the genital orifice on the dorsal surface of the cephalothorax in the interval between legs I and II. The introitus of the female is a longitudinal slit at the anterior end of the ventral side in front of the last pair of legs.

The details of morphological and biological features of *D. folliculorum* were presented by Simon (1842), Wilson (1843), Majocchi (1879), Hirst (1919), Fuss (1933), Breckenridge (1953), Spickett (1961), Akbulatova (1963), Riechers and Kopf (1969), Desch and Nutting (1972), and Byun et al. (1983).

Demodex brevis Akbulatova (1963)

The morphology of *D. brevis* is similar to that of *D. folliculorum* and all stages of *D. brevis* are smaller than the corresponding stages of *D. folliculorum*.

The opisthosomal end in *D. brevis* is pointed and the length of the opisthoma is 1/2 or 1/3 of the total length. The eggs of *D. folliculorum* are arrow-head shaped with average diameter of 0.1mm, while the eggs of *D. brevis* are smaller with 0.06mm.

The details were reported by Akbulatova (1963), Desch and Nutting (1972), Nutting (1976), and Rufil

Table 1. Incidence of demodicids based on adhesive cellophane impression technique among residents of Taegu city, Korea(1989-1990)

Species	Male		Female		Total	
	No. positive	Percent positive	No. positive	Percent positive	No. positive	Percent positive
<i>Demodex folliculorum</i>	186	52.5	126	50.4	312	51.7
<i>Demodex brevis</i>	—	—	—	—	—	—
<i>Dermatophagides Pteronyssinus</i>	4	1.1	6	2.4	10	1.7
No. examined	354		250		604	

Table 2. Infection rates for *Demodex folliculorum* by sex and age groups among residents of Taegu city, Korea(1989-1990)

Age group (Y)	Male		Female		Total	
	No. examined	Percent positive	No. examined	Percent positive	No. examined	Percent positive
— 9	10	—	15	—	25	—
10—14	78	53.8	45	40.0	123	48.8
15—19	68	69.1	70	68.6	138	68.8
20—24	131	48.9	65	55.4	196	51.0
25—29	32	46.9	22	50.0	54	48.1
30—34	11	45.5	15	40.0	26	42.3
35—39	14	57.1	7	42.9	21	52.3
40—	10	50.0	11	36.4	21	42.9
Total	354	52.5	250	50.4	604	51.7

and Mumcuoglu(1981).

Results

Table 1 shows the incidence of demodicids by an adhesive cellophane impression technique. Among the 604 individuals examined, one or more species of demodicids were found in 314, which becomes an overall positive rate of 52.0 per cent.

Of the demodicids, *Demodex folliculorum* was found most frequently, the rate being 51.7 per cent among the residents, followed by *Dermatophagides pteronyssinus* with the rate of 1.7 per cent. In this instance no *Demodex brevis* was found.

The infection rates for *D. folliculorum* among the

residents by sex and age groups are presented in Table 2. In the sex specific rate of infections, the rate was higher among males than females and no significant difference by sex was found.

In the age specific rate of infections, it was found to be of highest prevalence among the 15-19 year age group in both sexes but was uniformly high in males and females of all age groups over 10 years.

In Table 3, the classification of *Demodex* species by developmental stages is tabulated. A total of 389 specimens were examined, ratio of each developmental stages were 49.1 per cent in adult females, 31.7 per cent in adult males, 7.3 per cent in nymph, and 12.2 per cent in larvae, respectively.

Table 3. Classification of *Demodex* sp. by stages(1989-1990)

Stage	No.	%	Length(μm)	Width(μm)
Egg	—	—	—	—
Larvae	47	12.2	282.7±45.1*	33.5±2.6
Nymph	28	7.3	392.0±46.8	41.7±6.3
Adult male	123	31.7	279.7±52.0	45.0±2.0
Adult female	191	49.1	294.0±58.1	51.9±3.0
Total number	389			

* Mean±Standard deviation

Discussion

Since the first discovery of the *D. folliculorum* by Simon in 1842, demodectic mites have been isolated from human beings in the nasolabial folds, on the nose, cheeks, eyelids, forehead, scalp, ear canal, nipple, back, chest, buttocks, penis, mons veneris, and rarely from the extremities.

Desch and Nutting(1972) confirmed that the two forms were distinct enough to be considered independent species, *D. folliculorum* and *D. brevis*, and reported that these two species were found on same host species, *Homo sapiens*, and even the same host individual.

Although the relationship of demodicids to clinical diseases remains uncertain, it was considered to play an important role in the etiology of blepharitis by some investigators(Post and Juhlin, 1963; Coston, 1967; Ayres and Mihan, 1967; Roth, 1979; and Byun et al., 1983), Rosacea-like demodicidosis(Ayres and Anderson, 1933; Ayres and Ayres, 1961; Spickett, 1962; Russel, 1962; Robinson, 1965; Hellier, 1966; Ayres and Mihan, 1967; Park et al., 1970; and Ruffi and Mumcuoglu, 1981), granulomatous rosacea(Nutting the Beerman, 1965; Marks, 1968; Marks and Harcourt Webster, 1969; Grosshaus et al., 1974; Ecker and Winkelmann, 1979), perioral dermatitis(Ayres and Ayres, 1961; Marks and Black, 1971; Bendl, 1976; Ohtaki and Irimajiri, 1977; Wilkinson et al., 1979; and Ruffi and Mumcuoglu, 1981), pityriasis fol-

liculorum(Ayres and Anderson, 1933; and Ayres and Ayres, 1961), and scalp demodicidosis(Miskjian, 1951).

In recent years some case reports on acneiform or rosacea type demodicidosis due to long-term application of corticosteroid ointment and excessive use of facial cream have been reported by some investigators of Korea(Park et al., 1969; Park et al., 1970; Chin et al., 1974; Kim et al., 1976; Park and Kook, 1978; Byun et al., 1983).

However, few report on the epidemiological studies of demodectic mites have been available in Taegu city because of the lack of attention given to the problem of human demodicidosis.

The findings in this study are based on the discovery of demodectic mites by a modified adhesive cellopane impression technique to the nasolabial folds and forehead on 604 subjects, and the infestation of hair follicles by mites was counted and found to be 51.7 per cent.

In practice, this is no indication of the true infection rate among the residents in Taegu city because the individuals for this study are not adjusted for the proportion of the residents belonging to each age group, social, and socioeconomic situation, and because one time cellophane impression technique is not sufficient to determine the true incidence of all demodicidosis.

However, the results are quite comparable with earlier reports based on consecutive skin biopsies and/or epilation of eyelashes.

From the data presented in Table 4, it is noted that although higher incidence is expected if repeated examinations and/or consecutive cutaneous biopsies are used, the overall incidence of *D. folliculorum* in this study is not excessively high if compared with results of other surveys for demodectic mite infections of man.

In the earlier reports on demodectic mites, Breckenridge(1953) conducted a study on infestation of the skin with *D. folliculorum*, and found mites in 186 of 1,435 cutaneous biopsies, for a prevalence of 13.0 per cent.

A study of Roth(1979) examined 100 consecutive

Table 4. The reported incidence of *Demodex folliculorum* in man

Source	No. tested	Incidence(%)	Materials and methods
Gmeiner (1908)	100	97.0	Adult cadavers
Fuss (1933)	33 21	90.9 52.4	Seborrheic skin conditions Dry conditions
Breckenridge (1953)	1,435	13.0	Skin biopsy of forehead
Post & Juhlin (1963)	50 45	68.0 51.2	Patients with blepharitis Patients without blepharitis
Norn (1970)	— —	25.0 72.0	Follicles of eyelashes and eyebrows in young patients Follicles of the nasolabial folds
Kim et al. (1976)	30	37.0	Healthy individuals
Roth (1979)	100	84.0	Skin biopsy of eyelids
Aylesworth & Vance (1982)	1,124	10.0	Cutaneous biopsy in healthy individuals
Byun et al. (1983)	173 27	49.7 66.7	Patients without blepharitis Patients with blepharitis
Present study (1990)	604	51.7	Adhesive cellophane impression technique of nasolabial folds among residents

eyelid biopsies and found an 84.0 per cent rate of infestation, all of which were *D. folliculorum*.

Aylesworth and Vance(1982) conducted a study on *D. folliculorum* and *D. brevis* in cutaneous biopsies, and reported that the prevalence of both species increased with age, but *D. brevis* had a lower prevalence.

Similar results have been obtained by Fuss(1933), Nutting and Green(1976), Roth(1979), and Byun et al.(1983).

In the present study there is a total of 312 cases or 51.7 per cent harbouring *D. folliculorum* in the 604 individuals examined. These results are similar to data reported by Post and Juhlin(1963), and Byun et al.,(1983) in patients without blepharitis. However, this study shows a higher prevalence than those reported by Breckenridge(1953), Kim et al.,(1976), and Aylesworth and Vance(1982), although Norn(1970),

Roth(1979) reported much higher figures.

As shown in Table 4, the incidence of infestation by the organism varies from author to author. This variation appears to be related to the area of skin examined and to meticulousness with which one searches for them.

Such consideration was also recognized by Jacobson(1971), and Roth(1979).

In previous studies on the sex differences in demodectic infestation, Nutting and Green(1976) carried out a study on the pathogenesis associated with hair follicle mites in Australian aborigines, and reported that older males were more heavily infested than females or younger males.

Based on the examination of 1,124 biopsies of skin, Aylesworth and Vance(1982) stated that males were more heavily infested than females with both species,

the difference being strongest for *D. brevis*.

They also commented that the higher infestation rate in males might be due to the increased androgenic stimulation of sebaceous glands, and that males were subjected to an increased level of environmental damage to their skin which might favor mite colonization and survival.

In present data, the infestation rate for demodectic mite was slightly high in males than in females. These findings are in agreement with those of previous investigators (Fuss, 1933; Nutting and Green, 1976; Aylesworth and Vance, 1982; Kim et al., 1976).

The age specific rate of demodectic infestation have been noted in previous studies. In a study of *D. folliculorum* in hair follicles of eyelid skin by Roth (1979), the incidence of demodectic infestation increased rapidly with increasing age of the subject, reaching 100.0 per cent in patients in the seventh decade and older; even in younger age groups the incidence was 50.0 per cent or greater.

A study of Fuss (1933) reported an 80.0 per cent rate of infestation in the 51 to 80 year old group. Nutting and Green (1976) in a study of Australian aborigines reported that older males were more heavily parasitized than younger age groups.

Our prevalence figures are not comparable since we measured only the prevalence of demodectic mites in the 5 to 45 year old group. The patterns of age specific rate in this study was initially established at 10 years of age and increased progressively with age. The peak rate was observed in the 15-19 year age group in both sexes, but was uniformly high for all age groups over 20 years.

Although the main reasons for the increasing infestation rate in the older age groups are not readily apparent, it was considered to be due to alterations in the follicles produced by the mites themselves, or due to skin changes associated with aging, and Aylesworth and Vance (1982) in the study on *Demodex* in cutaneous biopsies also recognized such considerations.

This is the first report on demodicosis among the residents in Taegu city.

Though it is difficult to generalize for the whole

city, one can safely conclude that the rate of demodectic infestation among residents is very high. The eradication and prevention of the demodicosis seems to be possible with the demodicidal drugs in combination with improvement of personal hygiene, and with particular attention to older age groups.

Summary

An epidemiological survey of demodectic infestation among randomly selected Summer school children of the Red Cross Society, Keimyung University students, and the general population of Taegu city was conducted from August, 1989 to October, 1990.

Demodectic mites were detected in the nasolabial folds by an adhesive cellophane impression technique.

The identification of demodectic mites obtained was made according to the morphological characteristics of *Demodex* species.

A total of 604 residents aged 5-45 years were examined, of which 312 cases or 51.7 per cent harbored the *Demodex folliculorum*, and no *Demodex brevis* was found.

In the sex specific rate of infection, the rate was slightly high among males than among females but no significant difference by sex was observed.

In the age specific rate, it was found to be more highest prevalent among the 15-19 year age group in both sexes but was uniformly high in males and females of all age groups over 20 years.

A total of 389 identifiable specimens classified as *Demodex folliculorum*, the ratio of each developmental stages was 49.1 per cent in adult females, 31.7 per cent in adult males, 7.3 per cent nymph, and 12.2 per cent in larvae, respectively.

Summarizing the results, this study indicates that the infestation rates for demodectic mites are now very prevalent, and the demodicosis remains one of health problems among the residents of Taegu city.

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