MICROSPORUM GYPSEUM ISOLATED FROM FELINE RINGWORM

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A review of literature indicates that there were many papers on the ringworm caused by *Microsporum gypseum*1,3). *M. gypseum* infections have been observed in human beings, dogs, horses, cats, etc.1,3). Feline cases of ringworm due to *M. gypseum*, however, were reported infrequently1,5,6).

Stockdale3) reported that isolates previously identified as *M. gypseum* had been found to be the imperfect states of *Nannizzia incurvata*, *N. gypseae*, and *N. fulva*. In few reports, however, *M. gypseum* isolate from patients have been examined on their perfect states4,7,9).

The present paper describes clinical and mycological findings on three feline cases of ringworm caused by *M. gypseum*. It also deals with the identification of *M. gypseum* isolates from ringworm lesions on cats by mating these isolates with each of two compatible single ascospore isolates of three species of *M. gypseum*.

CLINICAL DATA

Two domestic short-haired kittens and a one-year-old Persian cat. They were presented for diagnosis at the Veterinary Hospital, Faculty of Agriculture, University of Tokyo, Tokyo, Japan. All of them were born and reared separately in Tokyo. Both kittens had been raised in houses and gardens, and the Persian cat in a room with other healthy cats.

Clinical findings and other data on the patient animals are given in Table 1.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Sex</th>
<th>Type of lesion</th>
<th>Location of lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 months</td>
<td>Female</td>
<td>Loss of hair, scaling, crust</td>
<td>Head, around toes</td>
</tr>
<tr>
<td>2</td>
<td>1 month</td>
<td>Male</td>
<td>Crust</td>
<td>Paws, pads, around toes</td>
</tr>
<tr>
<td>3</td>
<td>1 year</td>
<td>Male</td>
<td>Loss of hair, erythema, crust</td>
<td>Scrotum</td>
</tr>
</tbody>
</table>

Ringworm lesions were located on the head, scrotum, paw and pad. Some of them showed mild scaling with loss of hair, and others crust formation accompanied by inflammatory response. Yellowish crusts were found on the lesions of pads which developed a rancid odor (Fig. 1). Under these crust, the affected skin was observed to be healing. The lesion on the scrotum of the Persian cat showed loss of hair, erythema, and crust formation.

No lesions on these cats exhibited fluorescence under Wood's light.

There was no evidence of transmission of infection from the cats involved to any human being by contact.

MYCOLOGICAL FINDINGS

Direct examination of clinical materials: Hairs, skin scrapings, and crusts were collected from lesions on the patient cats (Fig. 2). A small amount of clinical material was placed in a drop of 10% potassium hydroxide on a glass slide. Fungal elements were then microscopically observed in each feline case of ringworm (Fig. 3). Hairs invaded by the fungus had the mycelium in their interior and masses of arthropores on their surface. Crusts were revealed to be composed of epithelial debris, exudate, mycelium, and arthropores.

Cultures of clinical materials: Hairs and crusts were cultured on Sabouraud dextrose agar with cycloheximide and chloramphenicol at 24°C (Fig. 4). As a result, M. gypseum showed growth in all cases. These isolates of M. gypseum had the following morphological characteristics. When cultured on Sabouraud dextrose agar at 24°C, they grew rapidly and produced flat colonies with powdery surface. The surface of the colony was creamy or buff. The reverse side of the colony was dull yellow to tan in color. Colonies of the isolates on malt extract agar were examined for the growth rate, texture, and reverse pigmentation. In some isolates, colonies grew rather rapidly. They were submerged with thin surface growth. The surface was pale buff and the reverse side amber in color. In other isolate, colonies developed rapidly with a thin and fine-granular surface. The surface was pale buff and the reverse straw to tan in color.

Microscopically, a number of large, multiseptate, ellipsoid macroconidia with rough walls were observed, as well as small single-celled clavate microconidia (Fig. 5).

Pathogenicity test: Cats and guinea pigs were inoculated on the scarified skin with the isolates of M. gypseum from ringworm lesions on the cats. The results indicated that the isolates tested for pathogenicity were pathogenic for those animals.

Soil culture: The M. gypseum isolates from the feline cases of ringworm were singly inoculated onto soil plates, on which horse hair had been placed as a bait, and incubated at 24°C for 4 to 6 weeks. No cleistothecia, however, were observed on the soil plates. The soil used for this study had been autoclaved at 121°C for 15 minutes, had been sterilized by propylene oxide, or had been collected from a place where no keratinophilic fungi had been proved. The isolates from feline ringworm which had produced no cleistothecia singly, were cultured on soil plates by mating them with each of six single ascospore isolates of M. gypseum, namely, the "+" and "−" strains of N. in-
curvata, N. gypseae, and N. fulva. When cleistothecia were produced (Fig. 6), their structures were microscopically examined for the identification of the isolates. Each cleistothecium had the peridial appendages characteristic of the species and a number of ascospores in its central part (Fig. 7). Asci, containing ascospores, were observed when mounted with glycerol and alcohol (Fig. 8). The results of the mating examination are given in Table 2. The M. gypseum isolates from feline ringworm were identified as N. incurvata and N. gypseae. Two compatible isolates of N. incurvata were obtained from clinical materials collected from some lesions on one patient animal. Cleistothecial formation was observed on soil plates where these two isolates had been inoculated at the same time.

**DISCUSSION**

*M. gypseum* is known as a world-wide soil saprophyte. Under certain conditions, it is capable of assuming a parasitic character on animals. M. gypseum infection, however, had been reported to be relatively rare among cats.

In 1957, Kaplan et al. confirmed four cases of feline ringworm due to *M. gypseum*, after reviewing six cases previously reported. In 1961, Kaplan and Ivens found out six feline cases of *M. gypseum* infection in the incidence of ringworm among cats and dogs in the United States over a period from October, 1955 to February, 1959.

Three additional feline cases of ringworm due to *M. gypseum* were observed in Tokyo, Japan, over a period from October, 1964 to March, 1967. One of these cases had lesions with crusts on every pad.

Two compatible isolates of *N. incurvata* were separately obtained from clinical materials collected from ringworm lesions on a patient animal. From canine ringworm, the authors had previously isolated a strain of *M. gypseum*, which produced cleistothecia when inoculated alone onto soil plates. This canine strain of *M. gypseum* was identified as *N. gypseae*.

Artificial inoculation revealed that both “+” and “−” isolates of *N. incurvata* from feline ringworm were pathogenic for the cats tested.

**SUMMARY**

Three cases of feline ringworm caused by *Microsporum gypseum* were studied clinically and mycologically.

The *M. gypseum* isolates from feline ringworm were identified as *Nannizzia incurvata* Stockdale, 1961 and *Nannizzia gypseae* (Nannizzi) Stockdale, 1963, by mating them with each of the compatible single ascospore isolates of *N. incurvata*, *N. gypseae*, and *N. fulva*. Two compatible isolates of *N. incurvata* were obtained from a case of feline ringworm as the etiological organism.

**ACKNOWLEDGMENTS**

The authors wish to express thanks to Miss Phyllis M. Stockdale, of the Commonwealth Mycological Institute, Kew, Surrey, England, who kindly supplied them the single ascospore isolates of *N. incurvata*, *N. gypseae*, and *N. fulva*.

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猫の Ringworm から分離した Microsporum gypseum について

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（昭和42年4月28日受付）

Microsporum gypseum に起因する Ringworm については、これまで多くの報告が行なわれてきた。本菌による感染は人、犬、馬、猫などに認められている。しかし猫における M. gypseum による Ringworm の報告例は極めて少ない。

Stockdale はこれまで M. gypseum と同定された菌は 3 種の完全菌、すなわち Nannizzia incurvata, N. gypseum および N. fulva に分類されることを報告した。

しかしながら Ringworm 病変部から分離した M. gypseum の菌株については、多くの場合に、完全菌の検討まで行なわれていない。

著者らは先端から東大附属家畜病院の患畜について Ringworm の検索を行なってきた。今回東京都内で飼育の猫 3 例の Ringworm から M. gypseum を検出することができた。

これらの猫の Ringworm 病変部から分離した M. gypseum の菌株を、単独に、または 3 種の M. gypseum (N. incurvata, N. gypseum および N. fulva) のそれぞれ相対する 2 種の单一子囊胞子菌株とおのおのの交配して、土壤培養を行なった。その結果、今回ノンの菌株の Ringworm から分離した菌株は Nannizzia incurvata と Stokdale, 1961 および Nannizzia gypseum (NANNIZI) Stokdale, 1963 であると同定された。

なお同一猫の Ringworm から N. incurvata の交配によって Cleistothecia を形成する相対する 2 種の菌株を分離することができたことは興味あることである。

REFERENCES

EXPLANATION of PLATES

PLATE I

Fig. 1. Ringworm lesions on pads of a cat.
Fig. 2. Hair and crusts collected from feline ringworm caused by *M. gypseum*.
Fig. 3. Fungal elements found in the crust from a lesion due to *M. gypseum*.
Fig. 4. Culture of *M. gypseum* on Sabonraud dextrose agar after incubation at 24°C for 10 days.
Fig. 5. Macro- and microconidia of *M. gypseum*. ×100.

PLATE II

Fig. 6. Soil culture of two compatible isolates of *M. gypseum* from feline ringworm.
Fig. 7. Cleistothecium of *N. incurvata*. ×100.
Fig. 8. Asci containing ascospores of *N. incurvata*. ×370.