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TINEA CORPORIS CAUSED BY *MICROSPORUM CANIS*: REPORT OF A NOSOCOMIAL OUTBREAK

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In an unusual nosocomial outbreak, 13 staff and 11 patients in an acute and chronic health care facility were infected with the zoophilic dermatophyte, *Microsporum canis*. The dermatophyte was apparently introduced into the facility by a single infected patient. Likely modes of subsequent disease transmission include person-to-person contact, handling of contaminated laundry, and use of a shared razor. Infection control measures for managing such outbreaks are discussed.

INTRODUCTION

Nosocomial infections caused by bacteria, fungi, and viruses are well recognized (5). Most fungal outbreaks occur as a result of contaminated equipment, aerial contamination problems, and less frequently, personal contact (2, 11, 27, 30). Outbreaks due to dermatophytes are extremely rare (16, 24), and are generally not discussed in standard texts on nosocomial infection (5, 31).

The present communication documents the discovery and control of an outbreak of tinea corporis caused by the zoophilic dermatophyte *Microsporum canis*. This fungus infected 13 staff and 11 patients in an acute and chronic health care facility.

MATERIALS AND METHODS

All patients and staff suspected to be infected or exposed were interviewed and examined. Skin scrapings were obtained from suspicious cutaneous lesions. In addition, fungal growth media were inoculated with material from fomites and from the environmental surfaces on the ward. Recovered isolates of *M. canis* were identified utilizing standard techniques (3, 17). Characteristics of the organism were as described by Rebell and Taplin (28). Because some primary cultures did not produce macroconidia on Sabouraud's peptone-dextrose medium, all presumptive *M. canis* isolates were subcultured to bromocresol purple-casein dextrose agar (14) in order to stimulate macroconidium formation.

After positive identification, all isolates were compared with each other macro- and micromorphologically to insure that they were sufficiently similar that they could be postulated to represent the same infectious strain.

RESULTS

Description of the outbreak. - The Strathroy Middlesex General Hospital is a primary care facility serving a rural farming community in Southern Ontario. There are 79 acute and 31 chronic care beds. The medical ward in the acute care wing has 34 of the 79 beds.

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In November, an elderly farmer was admitted to the medical ward for the management of a cerebrovascular accident (CVA). In addition, a scaly erythematous rash was present on his chin, arms and legs. When scrapings from the border of the rash were examined with NaOH mounts, hyaline hyphae were observed. Subsequently, a zoophilic dermatophyte, *M. canis* was isolated. The lesions were initially treated with vioform hydrocortisone, but once cultures confirmed the presence of a dermatophyte, therapy was changed to tolnaftate. Subsequently, the lesions cleared rapidly.

This index patient with the CVA necessitated frequent, prolonged, close contact (feeding, bathing, shaving and turning) between himself and his nurse.

In early January, the same nurse on the medical ward developed a scaly erythematous rash on his arms. Cultures of the infected sites confirmed the presence of *M. canis*. Also, in early January, the index patient who had not as yet been diagnosed or treated was transferred to the chronic care unit. By the end of January, a second patient on the chronic care unit was infected. Subsequent infections in patients and staff, developed within the chronic care unit. By the end of February, six more nurses had developed infections on their arms, and six more patients were infected (Fig. 1).

The outbreak continued through March with new infections appearing in two nurses and two patients. In April, two nurses, a patient, a linen handler, and a ward clerk were newly infected (Fig. 1). At this point, institution of infection control measures was successful in eradicating the outbreak.

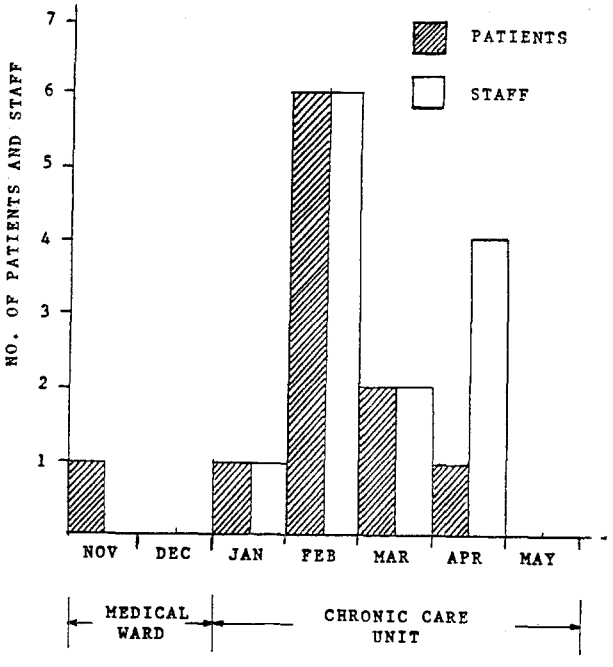

Figure 1. - Histogram of patients and staff infected with *M. canis* during outbreak.

Table 1 summarizes the epidemiological and clinical data on the infected staff. Thirteen of 25 staff were infected with eleven being nurses (one was a clerk and one was a linen handler). Eleven of the 13 staff were females. The mean age was 38.3 years, with a range of 28 to 52 years. All eleven nurses who were infected had lesions on their arms (Fig. 2) correlating with their duties in moving and physically helping patients (Fig. 3). The linen handler, predictably, had lesions on his hands and arms.

TABLE 1.

Epidemiological and clinical data on the outbreak of *Microsporum canis* infections among staff members.

	Age/Sex	Infected Site *
1)	52/M	Arm (R)
2)	31/F	Arm (R)
3)	33/F	Arm (R. + L.)
4)	33/F	Arm (R)
5)	28/F	Arm (R)
6)	38/F	Arm (L), Face, neck.
7)	35/F	Leg (L)
8)	52/F	Arm (L)
9)	43/F	Arm (R)
10)	39/F	Arm (R)
11)	43/M	Arm (R)
12)	28/F	Arm (R)
13)	43/F	Arm (R)

* R - Right
L - Left

Table 2 summarizes the epidemiologic and clinical data on the infected patients. Eleven of 31 patients on the chronic care unit were infected. Eight of the 11 patients were male. The mean age was 79 years, with a range of 54 to 99 years. Six of the eight male patients and one of the three female patients shared the same electric shaver. Three patients were fully ambulatory, two were partially ambulatory (in wheelchairs), and six were bedridden.

Environmental investigation. - Extensive environmental sampling of the chronic care unit was performed to determine the source of infection and possible sites of contamination. Locations that were sampled, cultured, and proven negative for the isolation of *M. canis* included: beds, night tables, laundry rooms, dirty utility room, floors, counter tops, bannister railings, windows, doorknobs and showers. Four electric razors were on the unit, but only two were used.

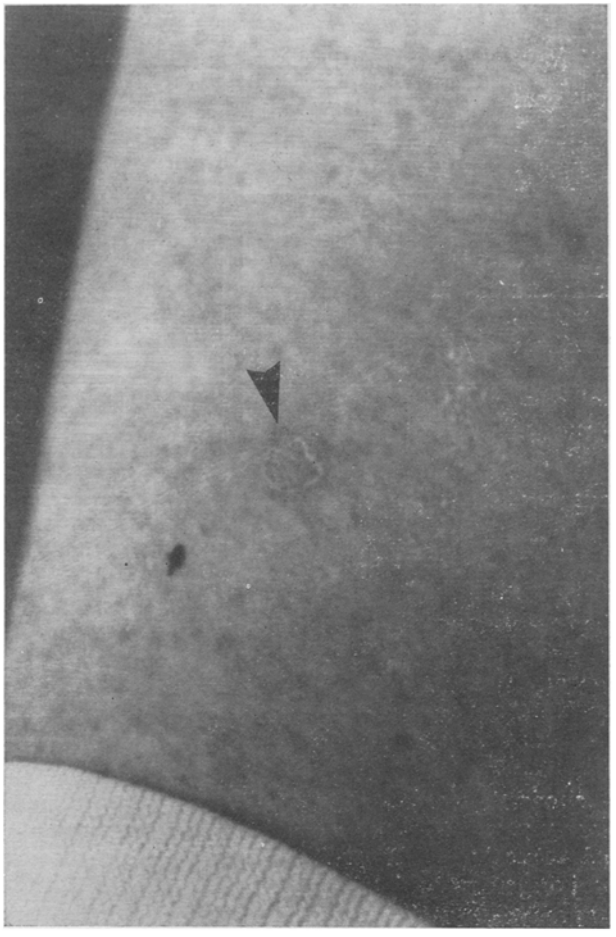

Figure 2. - Lesion on arm of staff member (at arrow).

TABLE 2.
Epidemiological and clinical data on the outbreak of *Microsporum canis* among patients.

	Age/Sex	Infected Site*	Electric Shaver use	Ambulatory
1)	54/M	Chin	Yes	Partial-wheelchair
2)	77/F	Face	Yes	Yes
3)	81/M	Neck	Yes	Yes
4)	77/M	Face, L. arm	Yes	Yes
5)	99/M	Face	Yes	No
6)	74/M	Face, L. arm	No	No
7)	78/F	Face	No	No
8)	85/M	Face, L. arm	Yes	No
9)	85/F	R. forearm	No	No
10)	84/M	Abdomen	No	Partial-wheelchair
11)	76/M	Face, L. arm	Yes	No

* R - Right
L - Left

Both were cultured, but only one was culture positive for *M. canis*. This razor was shared by some of the patients on the ward (Table 2). The linen stored in the dirty utility room was also culture positive. Figure 4 shows a typical cutaneous lesion of a patient from whom transmission to other patients may have occurred, possibly mediated by the shared electric razor.

Figure 3. - Close contact of patient and staff (note the proximity of the arm of a staff member and the face of the patient).

Figure 4. - Lesion on chin of patient.

Control of the outbreak. - All staff were kept off work until their lesions had resolved. Three staff members were initially treated with hydrocortisome cream; however, once the etiologic agent was identified, therapy with tolnaftate was instituted. All of the other staff were treated with tolnaftate. Eight of the 13 staff required griseofulvin therapy in addition to tolnaftate. Antifungal soap, « Desenex » (Penwott, Scarborough, Ontario, Canada) which contains 2% undecylanate acid was used for handwashing.

Four patients received clotrimazole, one received hydrocortisone cream but later was switched to clotrimazole, one received gentamicin cream and later switched to clotrimazole, one received gentamicin cream, and then switched to tolnaftate, two patients received iodochlorhydroxyquin, and three patients received tolnaftate. In addition, seven of the 11 patients required griseofulvin therapy.

The patients were kept on wound and skin precautions until their lesions were clinically healed and mycologically culture negative. Each patient was provided with his or her own razor. The environmental surfaces were cleaned with a disinfectant, Amphotone Plus which contains 7.4% benzylkonium chloride (Sanimark Inc, Victoriaville, Quebec, Canada).

DISCUSSION

Microsporum canis, a zoophilic fungus, is one of the less common etiologic agents of ringworm in the Western World (32). Cats and dogs are the major reservoirs of this fungus with nearly 50 percent of them, in some studies, having clinically inapparent infections (10, 21, 23). This fungus has been isolated less frequently from other species (1). In addition to animal sources, this organism has also been isolated from the soil (15). It has been suggested that contaminated fomites may be important as a secondary source of infection. Flies acting as vectors may play a role in transmission of infection (26).

Outbreaks of *M. canis* in humans are typically traced to animals (4, 8) harboring the fungus. High risk groups include members of domestic households with animals in the home, workers in pet shops, kennels, and homes for stray animals, veterinarians and other employees in veterinary hospitals (18, 33). Laboratory animals may transmit infection to their handlers (19). Family outbreaks with person-to-person spread have been described (6, 7, 35). Various studies have shown that, in communities where large numbers of cats and dogs roam, the incidence of *M. canis* infections is high.

In closed facilities, like orphanages (34), and boarding schools (12), outbreaks of tinea pedis due to *Trichophyton mentagrophytes* have been reported. In another study, tinea pedis was found in about 40 percent of patients in a long term hospital for the mentally retarded (13). Communal use of socks was implicated and *T. mentagrophytes* was the most frequently isolated agent (13). Other dermatophyte epidemics known to occur in such institutions include tinea capitis due to *T. tonsurans* (22, 25) and other tinea infections due to *Epidermophyton floccosum* (20, 29). Nosocomial outbreaks however, are extremely rare (16, 24) and are generally caused by the anthropophilic species *T. rubrum* (16, 24). The body site often involved in these infections was the trunk. Only patients were involved. In another reported *M. canis* outbreak occurring nosocomially, only children, who were residents of a medical center were infected (9). In our outbreak caused by *M. canis*, both patients and nursing staff were infected, with lesions being widely distributed - face, trunk and limbs. No one in our group had tinea capitis (often associated with *M. canis*) or tinea unguium.

Physical contact between patients and nurses appears to have played a major role in this epidemic. The further spread of the fungus in an infected individual may have been due to autoinoculation. Extensive cultures from the environment were negative, except for one shared electric razor and the used linen. The contaminated razor is suspected (but not proven) to have been the vehicle by which the epidemic spread so rapidly. It is noteworthy that some investigators shave animals, in animal models for dermatophytosis (29). Such trauma to the skin may be a predisposing factor for infection.

Finally dirty linen contaminated with *M. canis* may have infected the member of the housekeeping staff who handled the linen. We considered the possibility that « pet therapy », i.e. animals being brought into the health care centre in order to interact with patients played a role in the introduction or transmission of *M. canis* in this outbreak. However, patients infected early in the outbreak had no contact whatsoever with animals. It is probably not significant, therefore, that patients who were infected late in the outbreak, were exposed to animals as part of pet therapy. No animals were examined for the presence of fungus; however, the continuation of « pet therapy » to the present date has not resulted in any new cases of dermatophytosis.

In previous nosocomial outbreaks involving *T. rubrum* (16, 24), the route of spread of infection could not be traced. However, spread via the use of inadequately sterilized bedpans or via the hands of nursing staff was suggested (16).

Measures taken to control the spread of infection in the present outbreak included: a) cohorting infected patients, b) keeping infected staff off work until all lesions had cleared, c) treatment of all infected individuals with topical tolnaftate, and if the lesions were widespread or not improving, institution of systemic griseofulvin therapy, d) wound and skin isolation, and e) disinfection of the environment with a fungicidal agent.

While dermatophytic infections acquired in a hospital setting are rare, person-to-person, as well fomites spread can occur, resulting in patient and staff morbidity, and time lost from work for staff. Fortunately, once an infection is recognized, basic infection control measures will limit its spread.

Nosocomial dermatophytic infections in the future, may be more commonly encountered in chronic care institutions because of the increasing number of patients entering such centers. In this regard, we should note that some of us (J.K., S.K., R.C.S.) are currently engaged in the investigation of a *T. tonsurans* outbreak in a geriatric nursing home. The prolonged close nursing contact these patients require, favors person-to-person transmission. Also, economic measures, such as the communal use of electric razors, favor the spread of contagious skin diseases. The presence of a rash requires prompt notification of the Infection Control Staff with investigations to include fungal cultures of the skin and the institution of barrier nursing.

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