

Dermatophytes Among Commensal Rats In Kerala, India



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Abstract : Dermatophytes are closely related fungi which invade skin, hair, and nails (keratinized tissues) to develop infection, popularly called dermatophytosis and are considered as an emerging group of fungi. Animals, especially rodents have pivotal role in the transmission of dermatophytes to humans as well as animals. Thus a study was conducted to evaluate the carrier status of dermatophytes among commensal rats in Kerala. A total of 15 species of dermatophytes were identified from the collected 75 rats. The presence of emerging pathogens like dermatophytes in commensal rats is alerting, as human rat contacts are ineluctable in the particular environment in Kerala.

Keywords: Microsporum, Trichophyton, *Bandicotta indica*, *Rattus*, Zoonotic Fungal Diseases

Introduction

Dermatophytes (*Epidermophyton*, *Microsporum* and *Trichophyton*) are keratinophilic and keratinolytic fungi, categorized into anthropophilic, zoophilic and geophilic species (Simpanya, 2000). Majority of the members of the group have both anamorphic and teleomorphic state. Dermatophytes cause well defined infections termed dermatophytoses (tinea or ringworm) among humans and animals. Dermatophytes have the capacity to digest keratin *in vitro* in their saprophytic state and utilize it as a substrate. Most zoophiles and geophiles are distributed worldwide, but the former group is limited in relation with presence or absence of particular types of animals. The dermatophytes are classified into 3 genera, *Epidermophyton*, *Microsporum* (18 species) and *Trichophyton* (25 species) (Simpanya, 2000).

Globally, several species of rats & mice act as carriers of different species of dermatophytes (Hubalek, 2000). Rodents are considered as commensal animals and hence encounters are inescapable and opportunities of transmission of fungi are prominent. Sudden climatic changes, fluctuations in immune response and lifestyle pattern offer new opportunities for emerging zoonotic pathogens (Myaing, 2011). The rise in immunocompromised individuals results in explosive increase in the incidence of fungal infections (Tlamçani and Er-rami, 2013). However, studies on rodent vectored fungal zoonosis like dermatomycoses are scanty in the state of Kerala. Hence the present study.

Materials And Methods

Rats were trapped from the agricultural fields (*B. indica*) and house premises (*R. rattus*) in Kottayam and wetland oil palm plantation (*R. norvegicus*) in Kallara Grama Panchayath, Kottayam district, Kerala, India. The farmers

are regularly trapping rats to prevent damages and such trapped rats (75) in September 2012 to September 2013 were used for the study. Rodents were trapped by using box type wooden live traps baited with raw tapioca (agricultural fields), fried coconut (house premises) and Nymphae flowers (wetland oil palm plantation) which were set at 6.00 PM and checked at 06.00 AM in the next morning. Rats collected and killed by farmers were weighed, morph metrically measured, sexed and taxonomically identified. 14 samples were collected from each specimen such as ventral hair, dorsal hair, front nail, hind nail and tail scrapings. The collected samples were inoculated into Sabouraud Dextrose Agar, (SDA) (with chloramphenicol antibiotic) and incubated at room temperature for fifteen days. Suspected dermatophyte colonies were sub cultured into SDA plates and identified based on their macroscopic (growth rate, texture, pigmentation, rugal folds and exudates) and microscopic structures (hyphae, conidia ornamentation, arthrospore, chlamyospore, macro and microconidia) (Weitzman and Summerbell, 1995; Howard, 2003) by performing scotch tape method (Davey *et al.*, 1996). Urease test, hair perforation test, rice grain test and nutritional tests (thiamine, histidine) were also performed for identification.

Results

A total of 15 species of dermatophytes coming under 3 genera were isolated from the collected 75 rats (Table 1). *M. cookie* was the dominant dermatophyte isolate in the study. The rat-wise analysis revealed that *Bandicotta indica* was more prone to dermatophytes (13 species) followed by *Rattus norvegicus* (11 species) and *Rattus rattus* (8 species). A preponderance of genus *Trichophyton* (9 species) followed by genus *Microsporum* (5 species) was noticed. Genus *Epidermophyton* was represented with

only one species. Notable variation with regard to fungal carrier status between habitats (agricultural fields, house premises and wetland oil palm plantation) where rats are living was also well evident in the study.

Discussion

Rodents are excruciating and vexatious to humans since the beginning of mankind. Several researchers established the link between fluctuations in rodent reservoir population and its connection with many human cases/outbreaks of disease in various geographic regions (Mills and Childs, 1998; Heyman *et al.*, 2002 and Rose *et al.*, 2003).

The present rate of isolation is considered as very high, as available reports are very less, in connection with dermatophytes. The presence of dermaophytes closely associated with rodents like *Rattus rattus*, *R. norvegicus*, *Funambulus palmarum* (*T. mentagrophytes*) (Chmel and Buchwald, 1967); *M. musculus*, *R. norvegicus*, *R. rattus* (*M. gypseum*) (Reyes *et al.*, 1970); *M. musculus*, *Apodemus sylvaticus* (*T. verrucsum*) (Mc Aleer, 1980); *R. norvegicus*, *R. rattus* and *M. musculus* (*M. canis*) (Mantovani *et al.*, 1982) were established earlier. The presence of *M. canis* and *T. mentagrophytes* from rodents in Italy was also noticed (Papini *et al.* 1997). *M. persicolor* infections are acquired primarily through exposure to small rodents, including bank and field voles and mice (Badillet and Das, 1978). Stojanov *et al.* (2009) also noted the presence of dermatophytes such as *Trichophyton mentagrophytes*, *Trichophyton erinacei* and *Trichophyton persicolor* among rodents in cities.

Dermatophytes are considered as an emerging group of fungi with complicated pathognomonic manifestations in humans (Gniadek *et al.*, 2012). Dermatophytoses are considered as a communicable disease acquired from infected animal or from formites (Woodfolk, 2005). Dermatophytes are transmitted from wild rodents and the prevalence of human infections is known to be higher in rural areas where there is a reservoir of rodents. Soil is the predominant substrata for fungi and *visa-vis* transmission from soil to rodent was exculpated. Dermatophytes invade the stratum corneum of the epidermis and follicular ostium of hairs with considerable interspecies variations in capability to invade hair and nail (Rutecki *et al.*, 2000).

Conclusion

The isolation of dermatophytes from commensal rodents indicates the chances of infection to the interacting community. Reservoir studies are necessary for integrated public health responses which are established for emerging zoonotic diseases. The act of keeping pets in both urban and rural settings is on the rise, and the chances of disease transmission between rats-pets-humans are unavoidable. Hence detailed studies coupled with public health remedial action programmes are recommended.

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Table 1: List of dermatophytes isolated from rats in Kerala (n=75)

No.	Dermatophytes isolated	Rats species tested (n=75)		
		<i>Rattus rattus</i> (n=25)	<i>Rattus norvegicus</i> (n=25)	<i>Bandicota indica</i> (n=25)
		Frequency of occurrence (%)		
1.	<i>Epidermophyton floccosum</i>	0	0	8
2.	<i>Microsporium audouinii</i>	12	32	8
3.	<i>M. cookei</i>	16	40	8
4.	<i>M. gallinae</i>	0	20	16
5.	<i>M. gypseum</i>	8	20	20
6.	<i>M. nanum</i>	16	12	4
7.	<i>Trichophyton ajelloi</i>	4	0	4
8.	<i>T. megninii</i>	0	4	0
9.	<i>T. mentagrophytes</i>	0	8	12
10.	<i>T. rubrum</i>	0	12	4
11.	<i>T. schoeleinii</i>	4	8	4
12.	<i>T. terrestre</i>	0	4	0
13.	<i>T. tonsurans</i>	32	0	8
14.	<i>T. verrucosum</i>	0	4	8
15.	<i>T. violaceum</i>	8	0	4