

Keratinophilic Fungi Recovered from Feathers of Different Species of Birds in St Kitts and Nevis

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ABSTRACT

Objective: The aim of the present study was to investigate the occurrence of keratinophilic fungi including dermatophytes on feathers of domestic and wild birds in the islands of St Kitts and Nevis.

Methods: During 2010–2011, samples of feathers from ninety-four birds were examined by hair-baiting technique in Petri-dishes containing sterilized soil. Fungal growths appearing on the feathers and the hair-baits were microscopically examined and the cultures obtained were identified on the basis of their microscopic and colonial morphology.

Results: *Chrysosporium* constituted the majority (86.9%) of the 72 isolates of keratinophilic fungi, represented by mainly *C. tropicum* and *C. indicum*. *Sepedonium* spp isolates were recovered from nine of the feather samples; two of these were identified as *Sepedonium chrysospermum*, and the other two as *S. ampullosporum*.

Conclusion: Recovery of four isolates of the dermatophyte, *Microsporium gypseum* complex (two each of *M. gypseum* and *M. fulvum*) from feathers of birds is a finding of public health significance.

Keywords: Bird feathers, *Chrysosporium* spp, keratinophilic fungi, *Microsporium gypseum*, St Kitts and Nevis

Hongos Queratinofilicos Obtenidos de las Plumas de Diferentes Especies de Aves en St Kitts y Nevis

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RESUMEN

Objetivo: El objetivo del presente estudio fue investigar la presencia de hongos queratinofilicos, incluyendo dermatofitos, en las plumas de aves domésticas y silvestres en las islas de St Kitts y Nevis.

Métodos: Durante 2010–2011, se examinaron muestras de plumas de noventa y cuatro aves, utilizando la técnica de anzuelo queratinico (técnica de Vanbreuseghem) en placas de Petri con tierra esterilizada. Los crecimientos fúngicos que aparecieron sobre las plumas y los anzuelos de queratina de pelos (hair baits) fueron examinados bajo el microscopio, y los cultivos obtenidos fueron identificados sobre la base de su morfología microscópica y colonial.

Resultados: *Chrysosporium* constituyó la mayor parte (86.9%) de los 72 aislados de hongos queratinofilicos, representados principalmente por el *C. tropicum* y el *C. indicum*. Aislados de *Sepedonium* spp fueron obtenidos de nueve muestras de plumas. Dos de ellos fueron identificados como *Sepedonium chrysospermum* y los otros dos como *S. ampullosporum*.

Conclusión: La recuperación de cuatro aislados del complejo *M. gypseum* dermatofito (formado por dos *M. gypseum* y dos *M. fulvum* respectivamente) de las plumas de aves, es un hallazgo de importancia para la salud pública.

Palabras claves: *Chrysosporium* spp, plumas de aves, hongos queratinofilicos, *Microsporium gypseum*, St Kitts y Nevis

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INTRODUCTION

Feathers and hairs are a rich source of keratin and are regarded as one of the reservoirs of keratin-degrading microorganisms. Birds carry keratinophilic fungi passively through the intact feather (1). Some of these keratinophilic fungi are species of dermatophytes known to cause cutaneous infections of keratinized tissues, viz skin, feather, hair and nail (dermatophytoses) of humans and animals (1–3). Several workers have investigated the occurrence of keratinophilic fungi and dermatophytes on a wide variety of birds in different countries. Among the predominant keratinophilic genera of fungi associated with bird feathers are *Chrysosporium*, *Geomyces*, *Malbranchea*, *Microsporium*, *Myriodontium*, *Sepedonium*, *Myceliophthora*, *Arthroderma*, *Ctenomyces*, *Scopulariopsis*, and *Trichophyton* (3–8). There is no information on the occurrence of keratinophilic fungi on birds in the Caribbean region. Hence it was considered of interest to study the prevalence of keratinophilic fungi associated with feathers of domestic and wild birds in St Kitts and Nevis.

SUBJECTS AND METHOD

Location, land area and climate of the islands

The islands of St Kitts and Nevis, a part of the Leeward Islands, are volcanic in origin and are located in the northern part of the Lesser Antilles chain of islands in the Eastern Caribbean. St Kitts is located at 17°15' North latitude and 62°45' West longitude while Nevis is located at 17° North latitude and 61°30' West longitude. St Kitts has an area of about 69 square miles or 168 square kilometers while the area of Nevis is 36 square miles or 93 square kilometers. Both islands have a tropical climate with temperatures ranging from 17° – 33 °C. Average annual rainfall is 55 inches in St Kitts and 48 inches in Nevis.

Collection and processing of samples of bird feathers

Samples of feathers originated from 94 birds of 12 different species (Table). The samples included feathers from different parts of the bodies of the birds (tail, abdomen and head, nails and beaks) as well as feathers already dropped on the ground. The samples were placed in clean plastic zip bags which were labelled and transported promptly to the laboratory. The well-known hair-baiting technique (9), generally used for isolation of keratinophilic fungi from soil was adapted for recovering keratinophilic fungi from feathers. The feathers of each sample were cut into small pieces with the help of sterile scissors and forceps and scattered over sterilized soil in a Petri-dish. Pieces of sterilized child or adult human hair were added and mixed with the feather pieces, and moistened with sterile distilled water (SDW). The plates containing the samples of feathers and the hair-bait were incubated at room temperature (22–30 °C) for 4–8 weeks depending on the rate of growth, and periodically moistened with small quantities of SDW. Initially some samples of feathers were processed on soil plates both with

and without sterile hair-bait. A comparison of the results showed better recovery of keratinophilic fungi with the addition of hair-bait. Hence the latter technique was employed for all the samples of feathers.

Isolation and identification of keratinophilic fungi

Loopfuls of fungal growth appearing on the feathers and hair baits were microscopically examined, and transferred to slopes/plates of Sabouraud dextrose agar (Hi Media, Mumbai, India) supplemented with chloramphenicol (Falcon Chemox Pvt, Ltd, Ghaziabad, India) at a concentration of 0.05 mg/ml, and cycloheximide (Sigma, St Louis, MO, USA) at a concentration of 0.5 mg/ml, and Mycobiotic agar (Neogen Corporation, Lansing, Michigan, USA). The latter medium also contained chloramphenicol and cycloheximide at the concentrations stated in the dehydrated product. The cultures were microscopically examined to check for purity and sub-cultured to get pure cultures. The purified fungal isolates were identified up to species level as far as possible by a detailed study of their colonial characters and microscopic morphology in lacto-phenol blue mounts, and comparison of their characteristics with the descriptions of the species in the standard books and manuals (10–12). The study was approved by the local Ethics Committee.

RESULTS

Out of 94 samples of feathers representing 12 species of birds examined, 72 isolates of keratinophilic fungi were recovered. The distribution of the isolates according to the species of birds investigated is shown in the Table. *Chrysosporium*, a well-known genus of keratinophilic fungi, constituted the majority (81.9%) of the 72 isolates. Regarding the relative distribution of different species of keratinophilic fungi, *C indicum* was the commonest species (24.9%) followed by *C tropicum* (14.9%)

The well-known geophilic dermatophyte, *Microsporium gypseum* complex of world-wide distribution (11, 12) was recovered from two samples of feathers of Caribbean dove (*Leptotila jamaicensis*), and one each of pigeon (*Columbia livia*) and duck (*Anas platyr hynchos*). On the basis of characteristics of macroconidia, two of the isolates of *M gypseum* complex were identified as *M gypseum*, and the other two as *M fulvum*. Other species of fungi recovered from feathers in the present study included nine isolates of *Sepedonium* (two each of *S chrysospermum* and *S ampullosporum*, and five unidentified isolates), five isolates of *Scopulariopsis* (four of *S brevicaulis*, and one unidentified isolate), three of *Aspergillus* (two of *A terreus* and one of *A fumigatus*) and three of *Penicillium* spp.

DISCUSSION

The present report on the occurrence of keratinophilic fungi on feathers of birds in St Kitts and Nevis constitutes the first study of its kind in the West Indies. The predominance of *Chrysosporium* spp is in agreement with that reported in

Table: Prevalence of keratinophilic fungi on feathers of different species of birds in St Kitts and Nevis

Name (Species of bird)	Number of birds examined and number positive for different species of keratinophilic fungi								
	Number examined	<i>M</i> <i>gypseum</i>	<i>C</i> <i>indicum</i>	<i>C</i> <i>tropicum</i>	<i>C</i> <i>keratinophilum</i>	<i>C</i> state of <i>T</i> <i>sepedonium</i>	<i>Chrysosporium</i> spp	<i>Sepedonium</i> spp	
Domestic fowl (<i>Gallus domesticus</i>)	48	–	8	6	4	3	5	2	
Brown dove (<i>Leptotila jamaicensis</i>)	12	2	1	2	2	–	1	4	
Burbey dove (<i>Streptotilia risoria</i>)	2	–	–	–	–	–	–	–	
Peacock (<i>Pavo fuiticus</i>)	10	–	3	2	–	–	1	1	
Pigeon (<i>Columbia livia</i>)	2	1	1	–	1	–	–	–	
Turkey (<i>Meleagris gallopovo</i>)	2	–	2	–	–	–	1	–	
Duck (<i>Anasplaty rhynchos</i>)	2	1	2	–	–	–	–	–	
Love bird (<i>Agapornis roseicollis</i>)	2	–	–	–	–	–	–	–	
Wood pecker (<i>Melanerpes portoricensis</i>)	4	–	1	1	–	–	1	2	
Tocotucans (<i>Ramphastos toco</i>)	6	–	2	1	–	–	–	–	
Budgerigar (<i>Melopsittacus undulates</i>)	2	–	2	2	2	–	–	–	
Black sparrow (<i>Passer domestica</i>)	2	–	1	–	–	–	1	–	
Total (%)	94	4	23	14	9	3	10	9	
		(4.2)	(24.4)	(14.9)	(9.6)	(3.2)	(10.6)	(9.6)	

M – *Microsporium*, *C* – *Chrysosporium*, *T* – *Thielavia*

surveys of bird feather associated keratinophilic fungi in several other countries (4, 8, 13–15). *C indicum* was the most frequent species, followed by *C tropicum*, as also recorded in one of the surveys of feather associated keratinophilic fungi in India (8). In some other studies, *C keratinophilum* was found to be the predominant keratinophilic fungus followed by *C tropicum* on the feathers of most of the bird species (1, 3, 5).

The recovery of four isolates of *M gypseum* from the feathers of the birds is of public health significance. The birds possibly acquire *M gypseum* on feathers through contact with soil. *M gypseum* has been recorded on birds with varying frequency, from 0.2% to 35% (1, 3). It is unusual to observe that none of the 37 samples of feathers of fowls examined in this study yielded any isolation of *M gypseum* despite the fact these birds frequently come in contact with soil, and *M gypseum* has been frequently recovered from soils of St Kitts and Nevis (16). Similar negative results for

isolation of *M gypseum* from fowls and other poultry birds were reported from Bahrain and Egypt (1, 5). Mycological studies of clinically suspected cases of dermatophytosis in St Kitts and Nevis have not been carried out as yet. However, it may be mentioned here that two fungal isolates from ringworm lesions in dogs from the veterinary clinic in Ross University School of Medicine, St Kitts were identified as *M gypseum* by one of us (HCG). Mycological investigations of clinically suspected human cases of dermatophytosis may reveal cases of infection due to *M gypseum*, and other species of dermatophytes. *Sepedonium* species commonly inhabit soil and plant material and are rarely isolated from feathers of birds (1); their recovery from bird feathers in the present study is noteworthy. Scopulariopsis species, though known as common saprophytes, are frequently encountered as keratinophilic species, particularly *S brevicaulis* (1), as also demonstrated in this study.

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