



# Dermatophytes and other skin mycoses found in featherless broiler toe webs

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## Abstract

**Background:** Featherless broilers which are produced by a complex breeding programme from feathered parents carrying the Sc-gene, dissipates excessive body heat under hot and humid conditions. It has high body weight, and grows very rapidly when compared with standard commercial broilers. Their toe webs are bigger than standard commercial broilers, and could harbor fungi which can cause infections where there is the opportunity.

**Objectives:** To isolate and identify the presence of fungi in toe webs of featherless broilers.

**Methods:** A total of 50 featherless broilers' toe webs samples were examined microscopically for the presence of fungi. The samples were examined microscopically and culturally using standard microbiological techniques.

**Results:** The fungi recovered were as follows. *Microsporium gypseum* 9 (22%), *Trichophyton mentagrophytes* var. *mentagrophytes* 5 (12%), *Microsporium gallinae* 3 (7%), *Aspergillus flavus* 10 (24%), *Fusarium* sp 6 (15%), *Alternaria alternata* 3 (7%) *Scopulariopsis brevicaulis* 2 (5%) and *Candida albicans* 3 (7%), Conclusion: The featherless broilers' toe webs harbour fungi which cause mycotic skin disease and cannot be regarded as ordinary normal flora of toe webs

**Key words:** Dermatophytes, Non- dermatophytes, featherless broiler, toe webs.

## INTRODUCTION

Dermatophytes are among the most frequent causes of dermatological problems in domestic animals. They are classified in three genera, *Epidermophyton*, *Microsporium*, and *Trichophyton* which include about 40 accepted species. However, only a few species belonging to the genera *Microsporium* and *Trichophyton* are usually the cause of dermatophytes in domestic animals [1]. They are usually divided into three ecological groups according to their main natural host or habitat: the anthropophilic (humans), the zoophilic (animals) and the geophilic (soil).

Animals serve as reservoirs of the zoophilic dermatophytes, and their infections have considerable zoonotic importance. Zoophilic dermatophytes such as *M. canis*, *T. mentagrophytes* var. *mentagrophytes* and *T. verrucosum* are significant causal agents of human ringworm in many areas of the world [1]. The incidence of dermatophytosis varies according to climate and natural reservoirs. However the pattern of the species of dermatophytes involved in dermatophytosis may be different in similar geographical conditions, both in human and animal. [2]



In this study, the occurrence of dermatophytes and other skin mycoses found in toe webs of featherless broilers was investigated.

## Materials and Methods

### Collection of samples

A total of 50 featherless broilers kept at the animal house at 30°C at the Faculty of Agriculture, Hebrew University, Rehovot Campus, Israel were used in the study. Presence of scaling (if any) was noted. Samples of skin scrapings from the interdigital toe webs were taken using a sterile scalpel. Scalpels were changed for each sample to avoid contamination of specimens. The scrapings were collected in a piece of sterile paper, carefully folded, and then placed in an envelope for storage in air-tight containers to await microscope and cultural analyses.

### Sample Processing

#### Microscopy and culture of samples

A small sample of each scraping was digested by placing it on a microscope slide and adding one to two drops of 20% Potassium hydroxide (KOH). A cover slip was applied and the slide was heated gently over a flame as described by Hainer [3]. Each treated slide was then carefully examined under low (x10) and High (x40) power objectives to observe the fungal forms.

Each scraping was cultured, for dermatophytes onto sabouraud dextrose chloramphenicol actidione agar. A duplicate inoculation of the sample was also cultured on sabouraud's dextrose cycloheximide agar. For non dermatophytes, cultures were made on sabouraud dextrose agar supplemented with chloramphenicol to eliminate bacteria. All cultures were incubated at 28°C for up to 4 weeks. Fungal isolates were then subcultured onto plates of sabouraud's agar and potato glucose agar. The isolates were examined macroscopically and microscopically following staining with lactophenol cotton blue wet mount technique. The dermatophyte species were identified by gross and microscopic morphology and by in vitro tests, if required based on the criteria enumerated by Rebell and Taplin [4] and Frey et al [5]. The yeast's were identified with the taxonomic criteria outlined by Lodder [6]. Each

isolate was tested for the ability to ferment and/or assimilate different carbon sources. They were also tested for their ability to produce *Urease*, utilize KNO<sub>3</sub> as the sole nitrogen source and grow at 37°C

## Results

A total of 50 featherless broilers who presented with suspected superficial mycoses in the toe webs were examined during the investigation. Forty-one broilers (82%) were found to be mycologically positive by microscopy and culture. Only 5 chickens showed some scaling in their toe webs. The organisms recovered from those who presented with scaling were *Microsporium gallinae*, *Microsporium gypseum*, *Trichophyton mentagrophytes* var. *mentagrophytes* and *Candida albicans*. Many fungi belonging to 7 different genera were recovered from the toe webs of 41 of the 50 featherless broilers sample studied. They included *M. gypseum* =9 (22%), *M. gallinae* =3 (7%), *T. mentagrophytes* var. *mentagrophytes* =5 (12%), *Fusarium* sp =6 (15%), *Scopulariopsis brevicaulis* =2 (5%), *Alternaria alternata* =3 (7%), *Aspergillus flavus* =10 (24%) and *Candida albicans* =3 (7%).

Non-dermatophytes were recovered from 21 (51%) of the positive cases, dermatophytes from 17 (42%) and yeast from 3 (7%). The frequency of distribution of individual isolates is shown in **Table 1**. *Microsporium gypseum* and *Aspergillus flavus* were the most commonly encountered dermatophytes and non-dermatophytes respectively; while *Candida albicans* was the only yeast recovered.

Fungi	Positive samples	Percentage distribution
	n	%
<b>Dermatophytes</b>	<b>(17)</b>	<b>(42)</b>
<i>Microsporium gypseum</i>	9	22
<i>Microsporium gallinae</i>	3	7
<i>Trichophyton mentagrophytes</i> var. <i>mentagrophytes</i>	5	12
<b>Non-dermatophytes</b>	<b>(21)</b>	<b>(51)</b>

<i>Alternaria alternata</i>	3	7
<i>Aspergillus flavus</i>	10	24
<i>Fusarium sp</i>	6	15
<i>Scopulariopsis brevicaulis</i>	2	5
<b>Yeast</b>	<b>(3)</b>	<b>(7)</b>
<i>Candida albicans</i>	3	7
<b>Total</b>	<b>41</b>	<b>100</b>

**Table (1):** Frequency of fungi found from toe webs of 41 positive cases

## Discussion

The study showed that toe webs of featherless broilers that may be considered healthy harbour varieties of dermatophytes, non-dermatophytes and yeast. According to *Lison et al.*,<sup>[7]</sup> pathogenic yeast can be isolated from healthy -looking toe webs. Featherless broilers according to *Aaron*<sup>[8]</sup> do not suffer from heat related mortality and can survive in low and hot environmental temperature.

In this study, some of the fungi isolated were also recovered by *Oyeka*<sup>[9]</sup> on human toe webs. This could be because keepers of most domestic animals (Poultry) entered their environment (habitat) with bare-foot (to avoid cross- infection), but infected human foot web may cross- infect the birds. Infection of human foot could occur as a result of wearing of shoes<sup>[8]</sup> as this may provide warmth and moisture on the toe webs required by fungi to grow and cause damages in the tissue.

The occurrence of dermatophytes has been previously reported in domestic animals<sup>[1]</sup>. The study recovered dermatophytes and other skin mycoses from the toe webs of featherless broilers. This could be because of being featherless they are susceptible to infections<sup>[8]</sup>. They included *Microsporum gallinae*, *Microsporum gypseum*, *Trichophyton mentagrophytes var. mentagrophytes*, *Alternaria alternata*, *Aspergillus flavus*, *Fusarium sp*, *Scopulariopsis brevicaulis* and *Candida albicans*.

*Microsporum gypseum* was the most commonly isolated dermatophyte. Others, *Microsporum*

*gallinae* and *Trichophyton mentagrophytes var. mentagrophytes* are regular pathogens of foot infection<sup>[9, 10]</sup>. These fungi have been found in soil/ dust in many parts of the world<sup>[11]</sup> and their presence in this study could be attributed to poor sanitation of the broilers environment.

The presence of *Aspergillus flavus*, *Fusarium sp.*, *Alternaria alternata* and *Scopulariopsis brevicaulis* which are common soil saprophytes may be due to their ubiquitous nature of their spores in the environment and which can always be carried on healthy skin, toe webs inclusive. *Fusarium sp* has also been recovered from cases of foot infection, either alone or mixed with other pathogens<sup>[12]</sup>. This finding agrees with our study which shows that most fungi recovered were either alone or mixed with other pathogens. *Scopulariopsis brevicaulis* has also been isolated in an indoor environment and can often cause inflammatory lesions on the skin<sup>[13, 14]</sup>.

*Candida albicans* an opportunistic pathogen known to produce a diverse range of mucosal and cutaneous as well as subcutaneous and systematic mycoses<sup>[15]</sup> was also isolated.

In conclusion, featherless broilers' toe webs although bigger than that of feathered broilers harbor less fungi. This may be attributed to the particular temperature where they are kept with little contact with dust and soil. These birds can survive in low and hot environmental conditions in order to fully express their genetic potential of rapid growth and high meat yield unlike the feathered broilers. Finally the fungi recovered from the toe webs have been implicated in cases of mycotic skin disease and therefore cannot be regarded as ordinary normal flora of toe webs. These pathogens can cause infections under favourable conditions.

## Conclusion

The study was of a cross-sectional nature; so the risk factors identified for disability could be suggestive and unable to draw any conclusion whether these factors were antecedent or consequences of disability. Moreover 82.1% of the risk factors for disability were explained by this study. There may be other factors for disability, which were not identified in this study. Future longitudinal study with a large sample may be

conclusive of identifying the risk factors for disability. However the study has some positive points. Different socio-demographic variables like increased age, low literacy status, living alone, parity and chronic diseases like acid peptic disorder, tuberculosis, hypertension, ischemic heart disease, osteoporosis, genitourinary disorder and osteoarthritis were identified as associated risk factors for disability and the study emphasized considering both socio-demographic factors and chronic diseases for the prevention of disability. Policymakers should consider these factors for future planning of gender sensitive geriatric friendly health and social care services in order to prevent disability and to improve quality of life of geriatric female populations.

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